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MARCH, 1866.

## ON VERATRUM VIRIDE.

By Charles Bullock.

(Continued from page 325 of Vol. 37th.)

Note.—Since the publication of my previous article, Prof. Samuel R. Percy, M. D., has kindly furnished me with a copy of his essay on Veratrum viride. Finding that I have not given Prof. Percy proper acknowledgments for his elaborate investigations, I would refer to his essay published in the transactions of the American Medical Association for 1864. A full inquiry into the physiological and medicinal properties of the plant will there be found.

The object of the present investigation was to obtain information whether the alkaloid obtained from the plant was *identical* with veratria, and whether the resinoid of Prof. Percy contained any proximate principle to which its great activity could be attributed.

The resin from Veratrum viride, obtained by pouring the fluid extract into water, has a dark brown color, and contains so much fatty matter that it dries but imperfectly.

The resin was treated with ether until exhausted, it was then dissolved in alcohol, and the tincture concentrated by evaporation poured into acidulated water, maintaining constant agitation.

The resin, which precipitated in a finely divided condition, was collected on a filter and washed with acidulated water until the washings were no longer disturbed on addition of an alkaline carbonate.

The washings were concentrated, and carbonate of soda added to alkaline reaction. The precipitate obtained was washed, redissolved in dilute acid, partially decolorized by digestion with

purified animal charcoal, and again precipitated and well washed. When dry the precipitate weighed thirteen grains.

*The principle* thus obtained is sparingly soluble in cold alcohol, the alcoholic solution restores the color of reddened litmus paper, it unites with acids affording neutral solutions which are bitter to the taste. The sulphate is freely soluble. With reagents it gives the same reactions as the alkaloid described in my previous paper, and appears to be identical with the principle insoluble in ether therein described.

*Physiological Properties.*—A more extended experience is desirable to attest the effects of this alkaloid. Several trials were made by administering it to persons in health; the result of the experiments are as follows: one-fortieth part of a grain of the alkaloid dissolved in alcohol was administered every quarter of an hour, until one-eighth of a grain was taken; half an hour after taking the last portion the pulse in each case was reduced from eight to twelve beats in the minute. No nausea or other effects were experienced. An impression was produced on the throat resembling that caused by pyrethrum, and the benumbing effects of aconite were wanting.

*The resin* retains the alkaloid with great persistence; when a concentrated tincture of the pure resin is poured into acidulated water, the filtered solution affords a precipitate on addition of ammonia; this precipitate appears to be resin which was held in solution; it does not re-dissolve on addition of acid. When digested with acidulated water the resin does not dissolve, and evidences no basic properties when treated with very dilute acids. So far as opportunity has presented for trying the medicinal effects of the resin, it has been found, in doses of one-third of a grain repeated in half an hour, to produce quite as much sedative effect as the alkaloid.

The character of this resin affords a subject for farther investigation; its insolubility in acid solutions and want of basic properties tend to show that it is not an alkaloid in an amorphous condition.

*As a Summary of this Investigation* we find,

*First.* That Veratrum viride contains two alkaloids, one soluble in ether and the other insoluble in that menstruum. Neither of these principles answer in their chemical reactions to veratria.

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*Second.* That the resinous matter which precipitates when the concentrated tincture of the root is poured into acidulated water carries down with it a notable portion of the alkaloid insoluble in ether.

*Third.* That the alkaloid insoluble in ether, when administered in small doses, has a very perceptible sedative effect on the circulation without producing any other disturbance.

*Fourth.*—That the pure resin produces sedative effects nearly or quite equal to those obtained from the alkaloid.

*February* 19, 1866.

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## SULPHOCYANIDE OF MERCURY—PHAROAH'S SERPENTS. OLEATE OF SODA AND SOAP BUBBLES.

In the January number of this volume, allusion was made to this salt, and its use as a toy. An esteemed correspondent, whose experience in the manufacture of this salt has rendered him familiar with it, has sent us the following information, which he desires to be anonymous. Take of anhydrous prussiate of potash, (ferrocyanide of potassium,) in fine powder, 184 parts; salt of tartar, (carbonate of potassa,) well dried, 69 parts; sublimed sulphur, clean and dry, 128 parts; finely-powdered charcoal, 6 parts; mix them thoroughly, seeing that there are no lumps of aggregated powder, which object is best accomplished by sifting; and a little extra care in getting the materials thoroughly pulverized and mixed will be amply repaid by the purity of the product.

Place the powder, thus prepared, in an iron vessel, and heat gently, (not quite to redness,) when the edges and bottom of the mass become fused to about the depth of half an inch, stir it thoroughly and rapidly with an iron rod, so as to melt the whole down as soon as possible. When it ceases to flame, and reaches a state of nearly tranquil fusion, which is attained at a heat materially below redness, it is to be cooled; then dissolved in about six or eight times its weight of water, and filtered or strained to separate the insoluble sulphuret of iron. The clear solution may be considered to be a tolerably pure solution of

sulphocyanide of potassium, ($K.CyS_2$,) though there are always small quantities of secondary products formed.

The rationale of the process is probably as follows:—The reaction being between 1 eq. of dry ferrocyanide of potassium, 1 eq. carbonate of potassa, eight equivalents of sulphur, and one of carbon; the potassium and the cyanogen of the ferrocyanide, the potassium of the carbonate, and six equivalents of the sulphur unite to form three equivalents of sulphocyanide of potassium, $3(K.CyS_2)$, the iron of the ferrocyanide and the remaining sulphur form the insoluble sulphuret of iron, whilst the carbon, assuming the oxygen of the liberated potassium, passes off with the carbonic acid as carbonic oxide, and is burnt during the process.

Having now a solution of sulphocyanide of potassium, the next step is the solution of pernitrate of mercury, ($HgO^2,2NO^5$,) which is obtained by dissolving mercury in hot nitric acid, and heating until a drop of the solution will not form a precipitate with a solution of chloride of sodium. The solution should then be diluted with water until each ounce of mercury used is represented by a pint and a half of the solution.

The solution of sulphocyanide of potassium is then poured gradually into the mercuric solution as long as a precipitate is formed, *and no longer*, (as the mercurial sulphocyanide is soluble in the solution of nitrate of mercury, when in excess). The precipitate is heavy and subsides rapidly; it is washed in several—three or four—waters by subsidence and decantation, then the creamy sediment transferred to a muslin cloth and squeezed, gently at first, and then more forcibly, and the lump of moist sulphocyanide of mercury, when turned out of the cloth, will be found in just the right condition to be moulded into cones with the fingers. Sometimes mucilage of tragacanth is added, but it is not necessary, as the dried salt ($HgCyS_2$) has, like the white precipitate of the shops, considerable firmness in mass. The actual play of affinities, during the combustion of the salt, is, perhaps, not certainly known; but the following rationale, involving 24 equivalents of the salt, may be assumed to approach nearly to the truth:—

| Before Combustion. | | After Combustion. |
|---|---|---|
| 24(HgCyS$_2$)= | Hg$_{24}$ | Hg$_{12}$, passing off in vapor. |
| | N$_{24}$ | N$_4$, evolved in a free state. |
| | | 5(N$_4$ C$_6$), mellon, forming the chief bulk of the snake. |
| | C$_{48}$ | 18(CS$_2$). The elements of 18 equiv. of bi-sulphuret of carbon, which, by assuming 108 eq. oxygen from the air, become carbonic and sulphurous acid gases. |
| | S$_{48}$ | |
| | | 12(HgS), cinnabar, which partially remains in the snake, and is partly consumed and volatilized on the surface. |

While on the subject of chemical toys, we may as well refer to another. Philosophers, as well as children, may be amused and instructed by blowing bubbles. Several years ago, an account was published of the capacity of a solution of oleate of soda to yield bubbles of extraordinary dimensions and of gorgeous coloring. Our correspondent has taken some pains to investigate this property, and finds that the success of the experiment depends largely upon the purity of the oleate used. The commercial oleic acid made by the manufacturers of stearic acid does not afford an oleate of soda that answers the purpose intended, even though it be purified by combination with oxide of lead, and separation by ether, etc.

The best results were obtained as follows:—Dissolve two ounces of good white Castile soap in 20 fluidounces of boiling water, and add about one ounce of sulphuric acid, diluted with two fluidounces of water, and stir together; the fatty acids of the soap are separated and rise to the surface, where they collect and float as a clear yellowish oily layer. The vessel is now removed from the fire, and, with a syphon, decant the acid solution of sulphate of soda constituting the inferior layer of liquid, carefully avoiding the loss of the oily part by stopping in time. The oily acids are then well washed three successive times in hot water, separating them as before, after which, by exposure to cold, they solidify. The mass is then weighed, put in a suitable dish, and half its weight of finely-powdered litharge added, and the mixture digested at a heat of 212° to 225°, until complete union is effected. The resulting oleo-margarate of

lead, which differs from lead plaster only in containing a smaller proportion of oxide of lead, is to be agitated with at least ten or fifteen times its weight of ether, in a bottle, until it is completely disintegrated. The resulting liquid is transferred to a filter and closely covered; an ethereal solution of acid oleate of lead passes through, and a residue of acid stearate or margarate of lead is left on the filter. To the ethereal solution, add aqueous muriatic acid as long as chloride of lead is precipitated, shake thoroughly, and pour off the resulting ethereal solution of oleic acid, recover the ether by distillation, and the residue in the retort will be nearly pure oleic acid.

To make the oleate of soda, add two fluidrachms of oleic acid to one pint of boiling water, and then solution of pure caustic soda very gradually, until a clear solution is effected, *very carefully avoiding an excess of soda*, and, when cold, add sufficient water to make the solution measure a pint, if necessary. To this standard solution of oleate of soda, add one-half its bulk of glycerin, and the "suds" are ready for use in blowing bubbles. With a funnel about two inches in diameter, our friend has blown bubbles fully sixteen inches in diameter and of remarkable permanency, and so exceedingly beautiful and interesting, that he felt repaid for the time and trouble expended.—Ed. Amer. Jour. Pharm.

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## PHARMACY IN BUENOS AYRES—"THE REVISTA FARMACEUTICA."

This enterprising representative of South American Pharmacy, in the form of a monthly periodical of 24 octavo pages, is published under the auspices of the Society of Pharmacy of the Argentine Nation at Buenos Ayres.

This journal, originally published as a quarterly, has been issued in its present form for the past year or two, and is under the management of a commission appointed in the Society, who are aided by contributions from other active members of the Society, which now numbers forty-four. In addition to its list of original papers we observe a well selected review of the foreign periodicals, chiefly European.

Several of the communications, we observe, are upon substances indigenous to or peculiar to that rich, but as yet imperfectly developed country, which no doubt contains many products as yet unknown, which may prove of value to mankind. Among others we notice, in looking through some of the former issues, an account of the soap manufactured for domestic use, from that unique production of Buenos Ayres, the grease of horses, and other members of the equine family, with observations upon its chemical composition. This substance appears to be produced in considerable quantity, and has played an important part also as an illuminating agent;* we observe also two or three papers upon the cantharides found in that country, and its preparations, one of which, by Dr. H. Burmiester, has been reprinted in this journal, (vol. xxxvii. p. 268), and an essay by Prof. Puiggari upon chemistry applied to hygiene. Several miscellaneous papers of a scientific character also find a place here, among which we may mention, some observations upon these curious Armadillo-like fossils, the various species of Glyptodon, found only in South America, and of which the best collection extant is said to be in the museum of that city, by Dr. Burmiester, Curator of the Museum, with scientific descriptions; also Meteorological Observations, and a note upon a new species of Cetacean found upon the coast of Buenos Ayres, by the same author. An account of the geology of the republic, by Prof. Chas. Murray, with a discription of its valuable mines of gold, silver, copper, &c., and its deposits of limestone, gypsum, asphalt, coal, &c.

We learn from its pages that the Society of Pharmacy has been actively engaged in promoting the interests of pharmacy by bringing to the notice of the government the necessity of establishing an authoritative standard, for the purpose of regulating the diversity of action among pharmaceutists in regard to the preparation and compounding of medicines; the large foreign population always existing in Buenos Ayres, and the diverse nationalities represented in the medical and pharmaceutical pro-

*The town of Montevideo was, until lately, lighted by means of this grease, though since the prevalence there of a malignant disease, attributed by the ignorant portion of the community to its use—its employment in that locality has been abandoned.

fessions in that city, having given rise to considerable inconveniences. A carefully prepared volume of 160 pages, compiled by Pedro Banon, one of the members of the Society and Inspector of Pharmacy, in conjunction with Dr. Alburellos, Professor in the College of Medicine, is now only waiting the sanction of the Government to become recognized as the National Pharmacopœia. The Society has also succeeded in obtaining the establishment of two new professorships in the Academy of Medicine in Buenos Ayres, for the especial instruction of pharmaceutists; one of which, the chair of Pharmacology, we observe, has been filled, by appointment of the Government, by Carlos Murray, corresponding member of the Philadelphia College of Pharmacy. The Society has also sought to foster the spirit of original investigation among its members, by offering prizes for the best essays containing an examination of substances employed in pharmacy, and by the foundation of a pharmaceutical library.

Not the least valuable portion of the papers appearing in the *Revista*, are those reprinted from the annals of the Society of Pharmacy of Santiago, in Chili; among which we observe several upon the medicinal plants employed among the natives of that country, the properties of which are but little known. We note the following, viz.:

An analysis, by Dr. Angel Vasquez, of the gum of a species of *Cardon?* belonging to the Bromeliaceæ, which, occurring in considerable quantity, has been proposed as a substitute for gum arabic, and is remarkable in containing a large amount of gummy matter, somewhat similar to cerasin, and 53 per cent of pectic acid.

Also, an essay upon the *Euphorbia chilensis*, the juice of which is used as a drastic purgative; also observations upon the *Latua venenosa* of Chili, or tree of the enchanter, by the same author. The latter is a plant but lately described, and as yet but little known, which produces an effect upon the brain and nervous system similar to that of the Cannabis Indica, and, like that, apparently owing its efficacy to a resin. We find also a carefully prepared account of a remedy relied upon, in domestic practice in Chili, for the cure of hydrophobia, by José Vicenti Bustillos, giving a description of its botanical and therapeutical character-

istics, with an analysis, in which two new alkaloids are announced; and a brief account of a new kind of Rhatany, (Krameria cistoidea,) from Chili, said to be equal to the commercial article, by Isidro Salinas.

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## ON COLCHICIN.

By MM. Ludwig and Hubler.

In the *Journal de Pharmacie* for December, 1865, is a condensed paper embodying the chief points in the essays of the authors, which were published in *Arch. der Pharm.*, t. cxi., p. 10 and 194. Both chemists employed the seed of colchicum. M. Ludwig confirmed the statements of Oberlin, (see Vol. xxix., p. 235, of this Journal). M. Hubler does not appear to have met with the essay of John E. Carter, published in Vol. xxx., p. 205, of the American Journal of Pharmacy, but adopts almost precisely the same method as that writer; who, however, operated on the corms, and not on the seeds, and obtained a well-marked amorphous alkaloid. M. Hubler treated the seeds (without bruising, which he thinks unnecessary,) with hot alcohol of 90 per cent., added to the tincture [probably after removing the alcohol] twenty times its volume of water to separate fixed oil, filters and precipitates with subacetate of lead to remove coloring matter, and by phosphate of soda to separate the excess of lead, and finally with tannin to precipitate the colchicin. Pure tannin should be used, and its addition should be fractioned, so as to collect the first and last precipitates separately, as less pure than the rest. This precipitate consists of three equivalents of colchicin and two equivalents of tannin, and is very soluble in alcohol and insoluble water. It is pressed and triturated with hydrated oxide of lead, until a little of it, washed with water, affords no coloration with sesqui-salts of iron. The colchicin is separated by boiling alcohol, and, after evaporation, finally dried over sulphuric acid in a vacuum.

Colchicin thus obtained is amorphous, soluble in water and alcohol without residue, has an odor like hay, more evident when in hot water, and is very bitter. It represents the poisonous principle of colchicum. Without action on test papers, its solutions are precipitated yellow by chloride of gold, and white by corrosive sublimate. The mineral acids, as well as the

alkalies, color it yellow. If dropped into strong sulphuric acid and agitated, each particle is surrounded by a green tint passing slowly to yellow; if now a drop of nitric acid is added, it is surrounded by a zone of blue which, by agitation, becomes violet, brown, and, finally, yellow. If now ammonia is added, a beautiful color of onion peel is produced, which is changed to yellow by acids, but restored by alkalies.

At about 284° F., colchicin swells up like a resin, but it fuses without change, except in color, which becomes brown. It burns with a smoky flame and residue of charcoal. Potassa disengages ammonia. Its composition is expressed by the formula $C_{34}H_{19}NO_{10}$, which approaches that of Atropia $C_{34}H_{23}NO_6$, from which it differs but by $+H_4-O_4$.

M. Huber, like M. Oberlin, considers it is wrong to range colchicin among the alkaloids; it is indifferent to the acids, and, if it gives with them a crystallizable compound, the latter contains only the elements of colchicin. M. Oberlin has given the name of *colchicein* to this crystallizable principle, to which M. Hubler gives the per-centage composition of colchicin.

*Colchicin* and *colchicein* are, therefore, isomeric. The latter acting as a weak acid, displacing carbonic acid from carbonates. Alkaline solutions of colchicein cause white precipitates with all the metals which give colorless salts, *green* with ferric salts, *red* with those of cobalt; yellowish green with sulphate of copper. This precipitate is formed gradually, becomes crystalline, and contains colchicin and oxide of copper in equal equivalents. All these compounds are soluble in alcohol.

M. Hubler does not admit the pre-existence of colchicein, but thinks it is produced by the action of acids, and perhaps by bases upon colchicin.

We already know that both colchicin and colchicein are poisonous. M. Hubler believes his researches enable him to conclude that colchicin is only poisonous to carnivorous animals, and that, in a dose in which it would poison these, it appears without action on herbivorous animals.*

* This conclusion is in contradiction to the observations of Schroff and others. We should not lose sight of the fact that these experiments have been made with a colchicin very different from that employed by Schroff, which was made by the process of Geiger.

Our readers would do well to consult the paper of Mr. Carter, before referred to, and compare his results with those of M. Hubler. Unless we admit that colchicum contains an active alkaloid in its cormus, and a neutral active principle in its seeds, we cannot reconcile these results, because the processes of Carter and Hubler are so nearly identical that, if the same principle existed in both, it must have been produced in each case. Mr. Carter's alkaloid we have seen, handled, and tested, as to its alkalinity, and reaction with sulphuric acid and nitrate of potassa. As Mr. Carter does not appear to have treated the seeds, nor Mr. Hubler the cormus, it leaves the question open for new investigations which, we hope, will be made, and settle this vexed question—vexed because we have four experimenters, two on each side of the question of alkalinity. Mr. Carter's well-known accuracy leads us to hope that he will resume the subject, and apply his process to the seeds and give the results.—Ed. Am. Jour. Pharm.

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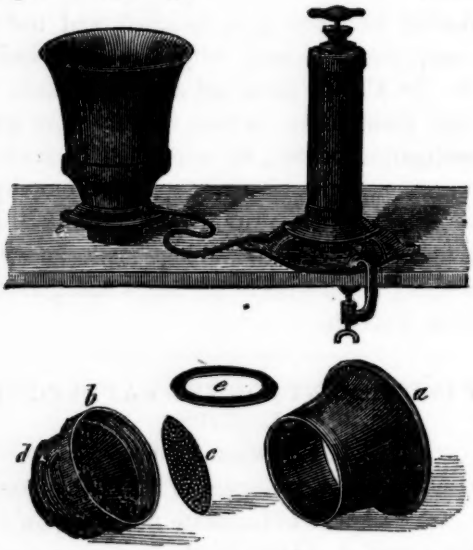
## ON A NEW INSTRUMENT FOR THE RAPID FILTRATION OF LIQUIDS.

By Edward Parrish.

This instrument is the invention of A. B. Spencer, of Rochester, N. Y. Its design is to facilitate filtration, on a small scale, by producing a partial vacuum in the receiving vessel, and thus rendering the pressure of the atmosphere available in forcing liquids rapidly through suitable media. It is made entirely of hard rubber, and is neither corroded by acids or alkaline solutions, nor by alcoholic or ethereal liquids. Although neither the principle nor its application is new, the use of this material in such an apparatus constitutes an important improvement, and the ingenious adjustment of the several parts leaves nothing to desire. The air-pump consists of a cylinder, about two inches in diameter and ten inches long, upon a cast-iron base, secured to the table or counter by a clamp; the piston, which works in this with great precision, contains a valve of simple construction. It will be apparent to any one who is familiar with syringes of this material, that it possesses unusual fitness for the purpose; a highly polished surface, with just sufficient elasticity to allow an

elastic piston to move easily and yet tightly through its length, makes an admirable air-pump. The absence of any liability to dent or bruise in handling, or to fracture by any ordinary application of force, is another recommendation.

The air-pump is connected with a funnel by a piece of elastic tube of convenient length. The construction of the funnel is shown in the lower drawing.




The upper section, *a*, has a screw turned upon the outside above its inferior margin; this fits a screw upon the inside of the lower section, shown at *b*; the perforated diaphragm *c*, of hard rubber, is designed to be covered with several layers of filtering paper or cotton cloth, or with chamois leather, or other filtering medium, which is secured tightly in place by the pressure of the upper section *a*, when screwed upon the lower section *b*; at *d* is shown a nipple, on to which the elastic tube is slipped to connect the funnel with the air-pump. A washer, marked *e* in both figures, serves to make an air-tight joint with the receiving bottle into which the funnel is designed to be set; this may conveniently be a quart salt-mouth bottle, if the quantity of liquid does not exceed that measure; but as there is little difference in the width of the mouth of the several common sizes, it may be adapted to almost any of them.

Besides the uses which will suggest themselves to the pharmaceutist, this instrument is admirably adapted to the purposes of the photographer, whose baths frequently become cloudy, and occasion long delays in the execution of his orders.—*Proc. Am. Pharm. Assoc.*, 1865.

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## PROPOSED ECONOMY OF ALCOHOL IN PERCOLATION, AS APPLIED TO THE EXTRACTS AND FLUID EXTRACTS OF THE PHARMACOPŒIA.

By Edward R. Squibb, M. D.

The increase in the price of alcohol since the last revision of the U. S. Pharmacopœia, has materially interfered with the use of the officinal extracts and fluid extracts, by the greatly increased cost of preparing them, and unless some plan can be found whereby either the cost or the quantity of alcohol may be reduced, it appears probable that these classes of convenient and useful preparations will be disused or debased.

The class of fluid extracts just coming into popular use has already suffered much, both in the way of disuse and debasement, and so little uniformity is there in the character and effects of these preparations, as put forth by different manufacturers, that it is far more difficult than ever before to base any conclusions upon their therapeutic application.

In the case of the solid alcoholic extracts, the cost of the alcohol is often four or five times that of the drug extracted, and not unfrequently amounts to two-thirds of the whole cost of the finished preparation. The present range in the price of alcohol places it at about ten times its former cost, with the certainty of a farther rise to at least twelve times. Under circumstances somewhat similar, the Government of Great Britain has been for some years past engaged in well directed efforts to reduce the price of alcohol for certain uses in the arts, but thus far these efforts have not been of much avail to pharmacy.

It therefore appears more practically useful to seek for an economy in the quantity to be used in effecting the purposes of the Pharmacopœia; and in this direction the present writer determined to make some efforts in the preparation of the following paper. This undertaking was commenced more than a year

ago, and has occupied much time and attention, in the hope that results might be attained such as might induce the Committee of Revision of the Pharmacopœia to meet and modify the formulas which the increased cost of alcohol has so seriously affected. These results, now to be given, have convinced the writer, as an individual member of the Committee of Revision, that a meeting should be called, and the matter seriously considered in regard to this or some better method of remedying an evil which could not have been foreseen.

The general plan of the Pharmacopœia for the preparation of its extracts and fluid extracts, is to exhaust the drug perfectly with an alcoholic menstruum by percolation, and then to drive off the menstruum, in whole or in part, by evaporation.

The plan here suggested, as being under present circumstances an improvement upon this, is to exhaust the drug imperfectly by the menstruum, or only to that point at which the menstruum is of more value than the resulting extract obtained by its use, thus sacrificing the cheaper drug rather than the dearer alcohol. For example, in making the alcoholic extract of belladonna, about 75 per cent. of the total extract is obtained by the use of one-third of the menstruum directed. It follows then, that two-thirds of the total menstruum is required to obtain the last fourth part of the total extract, and it is proposed to save this two-thirds of the menstruum whenever its value greatly exceeds the value of the product to be obtained by its use, and throw away the drug instead. Belladonna leaves of good quality yield about one troyounce of solid alcoholic extract from eight troyounces, by the use of about thirty fluidounces of alcohol. If well managed, three-fourths of this extract is contained in the first eight fluidounces of percolate, and this may easily be obtained by the use of ten fluidounces of alcohol, water being used to push it through. Now, taking the value of the troyounce of finished extract at $1.25 and the thirty fluidounces of alcohol at 3·5 cents per fluidounce, or $1·05, three-fourths, or ninety-four cents worth of the extract is obtained by the use of one-third or thirty-five cents worth of the alcohol, whilst the last fourth or thirty-one cents worth of the extract requires twice as much, or seventy cents worth of the

alcohol. Thus, by stopping the percolation at the point indicated, thirty-one cents worth of product is lost, but seventy cents worth of alcohol is saved, and this reduces the value or cost of the diminished product obtained, by thirty-nine cents. The value of three-fourths of a troyounce would then be fifty-five cents, (or 73⅓ cents per troyounce,) making an economy in value of 58 per cent. due to saving in alcohol over and above the value of the extract lost. This, too, is based upon the assumption that the therapeutic value of the extract is the same from first to last,—an assumption quite contrary to facts obtained in the case of colchicum seed, to be hereafter given.

In the case of the fluid extracts, the problem is by no means so easy of demonstration, and it is to the difficulties attending the application of the same plan to this important class of preparations that this paper is mainly devoted. The alcohol used as directed in the officinal formulas, even when carefully recovered as far as possible by distillation, rarely amounts to less than one-fifth of the total cost of the finished preparation. It often amounts to one-third, and occasionally to one-half or more, and this in operations upon a large scale. In the hands of the dispensing pharmaceutist the cost is far greater.

The difficulties in applying the proposed plan to this class arise mainly from the necessity that the finished preparation shall bear to the drug from which it is made, the definite relation of a minim for each grain in effective therapeutic value.

A series of preliminary experiments, which it is not necessary to detail, proved very conclusively, first, that in exhaustion by percolation there is a sufficient degree of uniformity of results to admit of the adoption of a model plan of proceeding applicable to drugs in general; second, that the extract or soluble matter yielded to the menstruum is not uniform in its chemical and therapeutic value as obtained during the different stages of the percolation, but diminishes in effective value far more rapidly than the extract does in weight; and, third, that this decrease in value depends upon the difference in solubility between the active and inactive portions of the extract, and that the ratio of this decrease is about the same for drugs in general, provided the proper menstruum be used.

Hence, it became necessary to adopt some one of the officinal preparations as a model, and study it out thoroughly, not only in its pharmaceutical relations, but also in the therapeutic relations involved in its pharmacy. And then, in the light obtained from such a model, to examine other drugs individually, to ascertain their points of difference or similarity.

In selecting a drug to serve as a model, colchicum seed was adopted, first, because it is an active definite purgative, and its therapeutic value thus easily determined by taking it; second, because its extract can be easily and perfectly dried upon a water bath for weighing, and can afterward be perfectly and entirely redissolved; and, third, because it presented a fair average facility of management in percolation, and represented a large and important number of preparations.

*Fluid extract of Colchicum Seed.*

The exact quantities of the Pharmacopœia were adopted and nineteen separate percolations with these quantities were made. At first English colchicum seed of good quality, powdered by the writer, was used, but fearing this might not represent the drug most frequently used, it was abandoned, and good German seed purchased in powder, as ordinary pharmaceutists would do, was substituted. This change exhibited a very marked difference between these two commercial varieties of the seed, in the proportion of dry extract yielded by different parts of the percolate, this difference amounting to full six per cent. in the earlier portions of the percolate, in favor of the English seed. Whether this difference extended to the therapeutic effect was not tried.

A critically accurate experiment with the officinal formula was then made and examined as a standard for comparison. The pint of finished fluid extract, strictly officinal, was found to contain 1452 grains of solid dry extract, or 89·5 grains to the fluidounce. Of the 1452 grains of extract 1008 or 69·38 per cent. was contained in the reserved percolate, or the twelve fluidounces which first passed through; and 444 grains, or 30·62 per cent. in the final percolate, or the four fluidounces to which

the last two pints of the percolate was reduced by evaporation. The results of this experiment occupy the second division of the table given farther on, under the head "Strictly Officinal." The third division of the table gives the results of an experiment with the officinal formula, but purposely made with less care and skill, and is intended to be such a result as would be obtained by a rather careless, inexpert, or unskilful operator, and it is supposed that it fairly represents the worst results that could be honestly obtained from any application of the officinal process. The pint of finished fluid extract in this case contained 1417 grains of dry solid extract, or 88·56 grains to the fluidounce. Of this, 945·67 grains, or 66·74 per cent. was contained in the reserved percolate, and 471·33 grains, or 33·26 per cent. in the final percolate, so that it seems hardly possible to get less than two-thirds of the total extract in the first twelve fluidounces of the percolate, or more than one-third in the remainder or final percolate, whilst the first twelve fluidounces is easily obtained by the use of fifteen fluidounces of menstruum, no matter how carelessly applied. One-half of each of these two portions were mixed together to make the officinal fluid extract as directed, and the other half of each kept separated for the trials of efficiency. It was next sought to determine the absolute and relative therapeutic values of the products of this formula, which, from its being carelessly or unskilfully conducted, would give results well guarded against being overstated. These trials of absolute purgative effect when taken, were made upon the writer's own person when in excellent health and upon a well regulated regimen, and sufficient intervals were always allowed between the purgative doses to enable the alimentary canal to resume its natural tone and condition. The doses for each trial were two. One taken at 6·30 P. M., half an hour before the evening meal, and the other at 10 P. M., or three and a half hours after the first, both in a measured quantity of water. When the doses produced no sensible effect throughout the night and day following, forty-eight hours was considered to be a sufficient additional interval before repeating the trial. But when a decided effect was obtained, a week and often two weeks were allowed to elapse be-

fore resuming the trials. When there was any reasonable room for doubt the trials were repeated, and therefore the results given are believed to be reliable.

It was first ascertained by repeated trial, that, of the identical powdered seed of which the fluid extract was made, not less than eight grains at the first dose and ten grains at the second would produce, on the following morning, a distinct decided purgative effect, and this attended with slight nausea and discomfort, which continued throughout the entire day. This, therefore, was adopted as the standard quantity for comparison. Now, the officinal formula for this and other fluid extracts is based upon their representing the drugs from which they are made, in the convenient and definite proportion of a minim for each grain, and this, from the very effective and perfect exhaustion ordered, is doubtless strictly true in a pharmaceutical sense; but whether this is equally true in a therapeutic sense remains to be tried. To determine this, precisely the same number of minims, accurately measured in a narrow pipette, of the finished fluid extract, as of grains of the powdered seed, were taken at the same time of day and under practically the same conditions of regimen, exercise, etc. The purgative effect on the following morning was distinctly and decidedly greater than from the powdered seed, but the nausea was the same, or possibly a little less. The fluid extract, therefore, over represents the drug from which it was made, and this may be reasonably accounted for upon two good grounds. First, the powdered seed is doubtless more perfectly extracted in the percolator than it can be in the stomach; and, second, because the fluid extract is presented to the living surfaces in a liquid form, much better adapted to both prompt and energetic action. This is theorizing, it is true, but the reasoning is after the fact, and cannot change its force.

It next remained to be tried whether the 33 per cent. of the total extract contained in the 25 per cent. of the total fluid extract, constituting the final percolate, was equal in purgative effect to the same quantity of extract contained in the finished fluid extract. That is, the finished fluidextract contained 88·56 grains of dry extract to the fluidounce; the reserved percolate only 78·806 grains; but the final percolate contained 112·83

grains to the fluidounce. Now, if the proportion of dry extract was a measure of the medicinal effect of the liquid which contained it, and was equal in medicinal effect as obtained from all parts of the percolate, then the final percolate, from its larger proportion of dry extract, should be 27 per cent. more effective as a purgative than the finished fluid extract, (as 88·56 : 112·83 : : 100 : 127·4.) That is to say, 6½ and 8 minims of the final percolate should produce a similar effect to 8 and 10 minims of the finished fluid extract, because the two portions of liquid contain practically the same weight of dry extract; and this was the starting point for the trials, but the doses were without sensible effect. They were then rapidly increased until a little more than double the standard dose of the finished fluid extract was reached. This double dose produced a purgative effect on the following day, which was, perhaps, slightly greater than that of the standard dose of the powdered seed, but not greater than that produced by half the quantity of the finished fluidextract. That is to say, it required twice and a half the quantity of the dry extract contained in the final percolate to obtain the effect of that contained in the standard dose of the finished fluid extract. This proves conclusively that the extract obtained in percolating this drug diminishes very rapidly in medicinal or therapeutic value as the percolation advances,—far more rapidly than the quantity or weight of extract obtained does; and also that, while the reserved percolate contains but 67 per cent. of the total dry extract, this 67 per cent. represents a much larger proportion of the total medicinal or therapeutic value of the powdered seed used.

The final percolate, used as above mentioned, was prepared as follows: The whole of the "two pints more of tincture," directed in the officinal formula to be obtained after the reserved percolate, was duly evaporated to the four fluidounces as directed; but it was found that a portion of the extract was precipitated during the evaporation. The evaporation was therefore continued at a low temperature on a water bath until the measure was reduced to about two fluidounces, when alcohol was added to bring it again to the prescribed measure of four fluidounces. By this management the precipitated portion and the oil were

all redissolved perfectly, and gave a clear solution, well representing the entire two pints of percolate last obtained. This management of the precipitate, which usually occurs in the evaporation of the final percolate of all drugs, has been often adopted in the preparation of fluid extracts upon the large scale, and is considered to be an improvement upon the more literal reading of the formulas of the Pharmacopœia, since it avoids the precipitation which occurs not unfrequently from the reserved percolate itself upon dilution with the one-third of its volume of a more watery solution.

The results above stated point directly to the conclusion that the sixteen troyounces of the powdered seed can be safely and certainly percolated to fourteen fluidounces, so that this fourteen fluidounces cannot represent less than fourteen troyounces of the drug, or minim for grain in medicinal value, and this with an unskilful manipulation and a good allowance against overstatement beside.

It was next proved by experiment, that in order to obtain this fourteen fluidounces of percolate, not more than twenty fluidounces of menstruum could ever be required, even by unskilful management, whilst with good management eighteen fluidounces is sufficient, the last portions being pushed through with water. Assuming the twenty fluidounces as the quantity necessary, of the three pints of menstruum to be used in accordance with the officinal directions, one pint and twelve fluidounces, or 58·3 per cent. is saved. Two-thirds of this saving being alcohol, at 3·5 cents per fluidounce, it amounts to 55 cents upon the fourteen fluidounces, considerably more than the two fluidounces of fluid extract would be worth, beside the saving in evaporating and in the skill and complexity involved in the officinal process, whilst the product of this simple and easy process is transparent, lighter in color, and likely to be so permanently.

The prominent necessity for economizing alcohol now, beyond what was recognized at the last revision of the Pharmacopœia, points toward the closest possible scrutiny of the officinal processes, to ascertain if these, as directed, are the best adapted to the rapid and early exhaustion of the drugs by percolation;

and this directed the attention of the writer, during these experiments, to some points which appeared worthy of a critical review in this new relation to the increased cost of alcohol. First, it was found that the quantity of menstruum used to moisten the powder before packing, was a matter of much importance. Thus, powdered colchicum seed, in the officinal quantity, moistened with four, six, eight, or ten fluidounces of menstruum, and packed as well as possible, one after the other, in the same percolator, gave reserved percolates containing 984, 1024, 947, and 786 grains of solid dry extract, thus showing conclusively that the officinal proportion, namely, six fluidounces, is the best adapted to the rapid or early exhaustion of this drug. The packing is much better and the percolation slower when eight or ten fluidounces are used, but the point of practical exhaustion is attained later, and the difference is more marked the earlier the observation is made in the progress of the percolation. When eight fluidounces of percolate has passed, the difference is very great. When twelve fluidounces has passed, the difference is as above given. When a pint has passed, the difference is smaller, but still notable. After this, the difference becomes so small as to be quite unimportant; and when carried to the extent of the officinal directions, the exhaustion is practically the same in all.

The form of percolator best adapted to this drug was next examined. Six experiments with each form, conical and cylindrical, all resulted very decidedly in favor of the cylindrical form by a difference of 50 to 59 grains of dry extract in the reserved percolate. If the percolation be carried out to anything like the extent directed by the Pharmacopœia, however, the results are practically the same whichever form be used. But should the formula ever be modified upon the basis of the plan here proposed, the form of percolator to be used should be changed to the cylindrical.

It was found in practice with this drug, as with percolation in general, that much alcohol may be saved by the skilful and judicious use of water to push the last part of the percolate through. The constant quantity of liquid held by sixteen troy-ounces of powdered colchicum seed is from sixteen to seventeen

fluidounces; and if this fluid be alcoholic, ten or twelve fluidounces of it may be easily pushed out of it by displacement with water without the smallest risk of admixture of the percolate with the water. In using the officinal quantity of seed, therefore, it is only necessary to have the menstruum four to six fluidounces in excess of the required percolate when water is used. One precaution, however, is necessary to the best attainable results, namely, that the water be poured on top just as the last of the spirit disappears from the surface. Attention to this point will always save two to three fluidounces of the menstruum, as a small excess will then form a partition, which follows the percolate down, and effectually protects it from admixture with the water. Should the percolation be arrested by the impaction of the surface, which sometimes follows the application of water, as in ipecacuanha, it is only necessary to scrape off the impacted or impervious surface, and renew the water from time to time.

In the table upon the opposite page are given the results of some of the percolations of colchicum seed made for this paper.

In the first division, the first column indicates the portion of the percolate represented by the figures upon the same line in the next column; these two columns recording an experiment wherein every fluidounce of percolate to the twenty-fifth was tested by evaporation. The table then commences again with a column indicating the portion of percolate represented by a weight of solid extract upon the same line with it throughout the remainder of the table. The "Total" is the sum obtained by the addition of all the portions of dry extract. The "Reserved Percolate" is a repetition of the line above, marked "1st 12 f℥." The "Final Percolate" is the whole extract yielded after the reserved percolate; and the "Finished Fluid Extract" is the yield of the finished extract after filtration. It should therefore always fall short of the sum of the weights of extract by addition, but in two instances does not do so. The percolation was in several instances carried beyond the point indicated in the Pharmacopœia, to exhibit the rate of exhaustion. This extract consists largely of oil, and, from some crude trials, is probably quite inert. The average may therefore, probably, be safely taken as the weight of the constant quantity of inert matter; and if

TABLE I.

*Percolation of Powdered Colchicum Seed.*

| Portion of percolate represented in next column. | Dry extract yielded. | Portion of percolate represented in the following columns. | PARALLEL EXPERIMENTS. Conical Percolator.* Dry extract Yielded. | Per centage of total extract. | Cylindrical Percolator. Dry extract Yielded. | Per centage of total extract. | PARALLEL EXPERIMENTS. Conical Percolator † Dry extract Yielded. | Per centage of total extract. | Cylindrical Percolator. Dry extract Yielded | Per centage of total extract. | Probable effective extract. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| fl. oz. | grains | | grains. | | grains. | | grains. | | grains. | | |
| 1.... | 108·21 | 1st 4 fluid oz | 424·50 | 29·215 | 423·57 | 29·101 | ..... | ..... | ..... | ..... | ..... |
| 2.... | 102·10 | 2d 4 " | 345·23 | 23·760 | 375·60 | 25·803 | ..... | ..... | ..... | ..... | ..... |
| 3.... | 98·02 | 1st 8 " | 769·73 | 52·975 | 799·17 | 54·90 | 734·16 | 51·811 | 780 84 | 53·722 | 732·34 |
| 4.... | 93·85 | 3d 4 " | 238·36 | 16·404 | 268·08 | 18·411 | 211·51 | 14·926 | 246·37 | 16·951 | 222·12 |
| 5.... | 88·96 | 1st 12 " | 1008·09 | 69·379 | 1067·25 | 73·317 | 945·67 | 66·737 | 1027·21 | 70·673 | 954·46 |
| 6.... | 84·90 | 4th 4 " | 141·31 | 9·7: 5 | 139 09 | 9·556 | 132·98 | 9·385 | 171·87 | 11·825 | 147·62 |
| 7.... | 78 34 | 5th 4 " | 89 08 | 6·131 | 68·34 | 4·700 | 101 12 | 7·136 | 71·12 | 4·893 | 46·87 |
| 8.... | 71·44 | 6th 4 " | 58·53 | 4·028 | 38·52 | 2·646 | 70 93 | 5·006 | 40·93 | 2 816 | 10·68 |
| 9.... | 64·68 | 7th 4 " | 41·49 | 2·855 | 32 84 | 2·256 | 43·90 | 3·098 | 32·60 | 2 243 | 8·35 |
| 10.... | 57·55 | 8th 4 " | 29·82 | 2·052 | 29·26 | 2·010 | 39·26 | 2·7 71 | 28·34 | 1 950 | 4·09 |
| 11.... | 50·42 | 9th 4 " | 30·00 | 2·035 | 27·97 | 1·92. | 30·56 | 2·156 | 26·85 | 1·848 | 2·60 |
| 12.... | 45·19 | 10th 4 " | 27·97 | 1·925 | 27·23 | 1·871 | 27·60 | 1·948 | 28·15 | 1·937 | 3·90 |
| 13.... | 39.36 | 11th 4 " | 26·32 | 1·812 | 25·00 | 1·718 | 25 01 | 1 764 | 26·30 | 1·810 | 2·05 |
| 14.... | 35.98 | Total. | 1452·61 | ..... | 1455 50 | ..... | 1417 03 | ..... | 1453·37 | ..... | 1186·62 |
| 15.... | 31·99 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 16.... | 28.15 | Reserved percolate. | 1008·09 | ..... | 1067·25 | ..... | 945·67 | ..... | 1027·21 | ..... | 954·46 |
| 17.... | 25·19 | Final percolate. | 444·52 | ..... | 388·25 | ..... | 471·35 | ..... | 426 16 | ..... | 232·16 |
| 18.... | 22·09 | Finished Fluid Extract. | 1432·03 | ..... | 1466·20 | ..... | 1432·03 | ..... | 1426·10 | ..... | ..... |
| 19.... | 17·46 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 20.... | 15·74 | In each fluid oz of Fluid Ext. | 89 50 | ..... | 91·64 | ..... | 89·50 | ..... | 89·13 | ..... | 74·13 |
| 21 ... | 13·38 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 22.... | 11·99 | 12th 4 fluid oz. | 24·45 | ..... | 24·26 | ..... | ..... | ..... | 25·74 | ..... | ..... |
| 23.... | 10 28 | 13th 4 " | ..... | ..... | 22·60 | ..... | ..... | ..... | 24·18 | ..... | ..... |
| 24.... | 8 19 | 14th 4 " | ..... | ..... | ..... | ..... | ..... | ..... | 20·37 | ..... | ..... |
| 25.... | 8 38 | 15th 4 " | ..... | ..... | ..... | ..... | ..... | ..... | 22·23 | ..... | ..... |

this constant quantity be subtracted from every weight of the whole series, the remainders will much more nearly represent the medicinal or therapeutic value of the extract. The result of this subtraction, applied to the last experiment of the last parallel, is shown in the final column of the table, as being the probable quantity of extract of average medicinal efficacy yielded from each portion of the percolate represented by it. This final column is headed "Probable effective extract," and 24·25 grains is adopted as the constant quantity, this being below the mean of three evaporations of the 12th four fluidounces of percolate. This calculation makes the reserved percolate represent 80·48 per cent. of the total medicinal value of the sixteen troyounces

* This experiment is strictly officinal, and is adopted as the standard. See page 112.

† This experiment is officinal, but less critically so. See page 113.

of the drug, and thus is in practical accord with the therapeutic trials.

The third division of the table, consisting of two pairs of columns, shows in the first pair the weight of dry extract contained in each successive portion of the percolate in another experiment, and the per centage value this weight bears to the whole of the dry extract contained in a pint of the finished fluid extract. This experiment was made with a conical percolator, and is critically officinal; and the next pair of columns is a precisely similar and parallel experiment, except that it was made with a cylindrical percolator, to exhibit the differences arising from the form of percolator.

The third portion, of two columns, is the record of the officinal experiments carelessly and unskilfully made with a conical percolator, the results of which were used in the therapeutic trials of the purgative effect. That is, one-half of the product of percolation was used to determine the dry extract, and the other half for the trials of medicinal effect. The fourth pair of columns of the table is an experiment parallel with the third pair, except that a cylindrical percolator was used, to exhibit the difference in result.

The percolators used in these experiments are so well adapted in size and form to the management of the officinal quantities that their dimensions may perhaps be usefully given. They are made of stout tin plate well and smoothly soldered. The conical one is 9 inches across the top, and the same in the length of the side down to the outlet, which outlet is $\frac{3}{8}$ inch in diameter. From this outlet projects downward a conical tube two inches long, diminishing in size to $\frac{1}{4}$ inch or less at the extremity. The cylindrical percolator is $3\frac{1}{8}$ inches across the top, $2\frac{1}{8}$ inches across the bottom, and 11 inches long. The bottom is shallow cup-shaped, with a conical tube in the centre an inch long, with a $\frac{1}{4}$ inch opening at the extremity. Both are fitted with close covers, and are used suspended by wire bails or handles attached to opposite ears on the upper rim. When used suspended, they are more easily kept vertical, and the percolation is therefore more uniform. It is beside more convenient and safe than when set upon a bottle.

In concluding the experiments with fluid extract of colchicum seed, it was determined to see how far facts would corroborate the general statement made in the early part of this paper, perhaps somewhat loosely as a matter of judgment or opinion rather than as an established fact, namely, that the high price of alcohol had tended to debasement as well as to disuse of this convenient class of preparations.

Two bottles of the commercial fluid extract of colchicum seed, purporting to contain one-quarter of a pound each, were purchased from an undoubted source. These were of different manufacture, and the two makers of these fluid extracts together, perhaps, supply four-fifths of the entire demand of the United States for these preparations. The labels of these bottles bear the officinal name in English. One has the sentence, "Dose, 5 to 15 drops;" the other, "Dose, five to twenty drops, gradually increased." The first of these was much lighter in color than the officinal, more fluid, and had a whisky odor, as though made from whisky instead of alcohol. It yielded 15·28 grains of dry extract to the fluidounce, or about one-sixth of the proportion (89·5 grains) yielded by the officinal preparation. This preparation was swallowed in doses gradually increased up to two and a half times the standard dose of the officinal preparation, under precisely similar conditions, without producing any sensible effect whatever, and was then abandoned for want of time to try it farther. It can therefore be at best but little over one-third the medicinal strength of the officinal preparation. This fluid extract was sold to the writer at 90 cents for the quarter of a pound and bottle.

The second bottle is about the color of the officinal, but much more transparent. It contained a small proportion of sediment of a light color, and had a slight odor of caramel, with but little odor of spirit or alcohol. It yielded 114·92 grains of dry extract to the fluidounce, or nearly one-third more than the officinal preparation, and this, in drying on the water bath, became very mucilaginous and tough, as though it mainly consisted of gum, and was wholly unlike the extract from the officinal preparation. For want of time, this preparation could not be tried thera-

peutically like the others were, by commencing with the standard dose and then increasing, so as to be able to state definitely the quantity that produced no sensible effect. But instead of this, one single dose of 17½ minims at 6.30 P. M. and 24 minims at 10 P. M. was taken, this being nearly 2⅓ times the standard dose. This produced a distinct and decidedly greater purgative effect than the standard dose, and a far longer and more distressing nausea. Indeed, the nausea continued for 36 hours, long after the purgative effect had ceased. As a matter of fair judgment or opinion, it may be stated that perhaps less than double the quantity of this preparation would have produced the same effect as the standard dose, and, to be quite secure against overstatement, one and a half times the quantity of the officinal may be set down as its therapeutic equivalent.

This preparation also cost 90 cents for the quarter pound and bottle, or $3.60 per pound, including bottle. The first gives evidence of plenty of badly rectified spirit or whiskey in its preparation, and but little colchicum seed. The second gives evidence of little spirit,—just enough to preserve it,—and a deficiency also of colchicum seed, extracted with a menstruum so watery that the mucilaginous part of the seeds was extracted and held in solution in undue quantity. These preparations are both at least 50 per cent. deficient in strength; and one certainly more than 110 per cent. deficient, as judged of by therapeutic comparison with a carelessly made officinal fluid extract. And yet, upon these preparations, differing between themselves at least 60 per cent. in medicinal value, the general character of colchicum seed as a medicinal agent depends. Any comments upon this condition of the materia medica seems quite unnecessary.

### *Percolation of Powdered Calisaya Bark.*

The next drug taken up for examination was Calisaya bark. Two lots of calisaya bark of five ceroons each are represented in the examination. These were bought at different times, and the lots powdered separately. Both were undoubtedly true calisaya bark,—the officinal Cinchona Flava,—and yet presented as great differences in the manipulation as are ever met with in

different parcels of the same article. The first five ceroons, called here, for convenience in designating the two, the "Old Bark," was coarsely powdered; that is, was in the condition officinally defined as "moderately fine powder." The second lot, or "New Bark," was powdered very finely, or as it is commonly sold as powdered bark.

The officinal quantity of sixteen troyounces, or 7680 grains, was taken for each percolation.

Both were percolated in cylindrical percolators with the officinal diluted alcohol, but moistened with different proportions of the menstruum, for the purpose of arriving at the best proportion.

The percolates from the old bark deposited, on standing, much more cincho-tannates and cinchonic red than the new; and the latter made a perfectly transparent fluid extract either with the use of glycerine or sugar; whilst the former would do so with neither of these under any management that could be adopted with the percolates after they had passed. In four instances, the percolation was carried beyond the officinal quantity, and always with the same result, of obtaining a proportion of solid extract, which diminished very slowly; so that the point of absolute exhaustion was never attained. And the percolates to the very last gave precipitates with solution of iodo-hydrargyrate of potassium. It may therefore be stated that here, as in the case of colchicum seed, no reasonable continuation of the process of percolation will absolutely exhaust the substance of soluble matters or of the alkaloids; but that a point is reached, and that always far short of that indicated in the officinal formula, where practical exhaustion is easily and economically attained. It is quite certain, that in this and in all drugs, a large per centage of the extract yielded is medicinally inert and useless; and it is extremely probable, if not proven, that when the menstruum is well selected and well adjusted to the greatest solubility of the medicinally active portion of the extract, that that portion is more easily and more rapidly washed out in percolation; and hence, that the quantity of the active principles in each successive portion of the percolate diminishes in a more rapid ratio than that of the whole extract. For example, cali-

saya bark may contain on an average four per cent. of its weight of alkaloids in their natural combinations, and this small proportion of the whole is alone medicinally effective, so that all the remainder should be excluded from medicinal use, if that was practicable. But calisaya bark, by the officinal process of percolation, yields twenty-two per cent. of its weight of dry extract. It follows, then, that at least four-fifths, or eighty per cent., of this dry extract is inert and useless, and need not be extracted if the remaining fifth, or twenty per cent., could be extracted without it.

Now, if we admit, in order to secure perfectly safe conclusions, that in the percolation the exhaustion of the active medicinal portion of the extract is not more easy or more rapid than that of the inert portion, but that it diminishes in the same ratio, then it is only necessary to subtract eighty per cent. from the weight of extract yielded from each successive portion of percolate to obtain a safe and useful index of the true medicinal value of every stage of the process of percolation. And this once obtained, shows, with something like mathematical accuracy, where the percolation may be stopped to obtain the best and most economical practical results.

The following table (Table II.) presents the results of three experiments with the old bark and one with the new. The first three vary only in the proportion of menstruum used to moisten the powder before packing. The middle proportion, viz., ten fluidounces, is the officinal one; but the last proportion, namely, eight fluidounces, was found to give the best results, and was therefore adopted in the fourth experiment with the new bark. This experiment with the new bark was repeated three times, and of these, the lowest or least favorable one was chosen for the table. The first column of the table indicates the portion of the percolate represented by the quantity of dry solid extract upon the same line in all the succeeding columns. Then, each of the four experiments has a group of three columns. The first of these three gives the number of grains of dry solid extract contained in the measure of percolate opposite to which it is found. The second column of the group gives the percentage amount of this dry solid extract as calculated from the total extract yielded

by the whole four pints of percolate. And the third column of each group gives the percentage amount of actual medicinal value as obtained by subtracting the eighty per cent. of inert extract from the yield of each successive portion of the perco-

TABLE II.

*Percolations of Powdered Calisaya Bark.*

| Portion of the Percolate represented. | Experiment I. Old Bark. Moistened with 6 fluidounces of menstruum. | | | Experiment II. Old Bark. Moistened with 10 fluidounces of menstruum (Officinal.) | | | Experiment III. Old Bark. Moistened with 8 fluidounces of menstruum. | | | Experiment IV. New Bark. Moistened with 8 fluidounces of menstruum. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Number of grains of dry solid extract yielded. | Per centage of the total extract. | Per centage of actual medicinal value. | Number of grains of dry solid extract yielded. | Per centage of the total extract. | Per centage of actual medicinal value. | Number of grains of dry solid extract yielded. | Per centage of the total extract. | Per centage of actual medicinal value. | Number of grains of dry solid extract yielded. | Per centage of the total extract. | Per centage of actual medicinal value. |
| 1st 4 f.ʒ | 545·35 | 31·051 | 6·210 | 527·10 | 30·310 | 6·062 | 564·70 | 32·604 | 6·521 | 380·05 | 23·005 | 4·601 |
| 2d 4 f.ʒ | 411·35 | 23·425 | 4·685 | 394·86 | 22·706 | 4·541 | 380·04 | 21·942 | 4·388 | 262·81 | 15·909 | 3·182 |
| 1st 8 f.ʒ | 956·60 | 54·476 | 10·895 | 921·96 | 53·019 | 10·604 | 944·74 | 54·546 | 10·909 | 642·86 | 38·914 | 7·783 |
| 3d 4 f.ʒ | 276·15 | 15·726 | 3·145 | 342·26 | 19·681 | 3·936 | 379·38 | 21·927 | 4·385 | 214·66 | 13·000 | 2·600 |
| 1st 12 f.ʒ | 1232·75 | 70·202 | 14·040 | 1264·22 | 72·700 | 14·540 | 1324·12 | 75·173 | 15·174 | 857·52 | 51·914 | 10·383 |
| 4th 4 f.ʒ | 202·47 | 11·530 | 2·306 | 192·06 | 11·044 | 2·209 | 188·91 | 10·907 | 2·181 | 192·43 | 11·648 | 2·329 |
| 1st pint. | 1435.22 | 81·720 | 16 344 | 1456·28 | 83·744 | 16·749 | 1513 03 | 86·780 | 17 356 | 1049 95 | 63·562 | 12·712 |
| 5th 4 f.ʒ | 155·95 | 8·824 | 1·765 | 107·98 | 6 209 | 1·242 | 86·68 | 4·970 | ·994 | 157·94 | 9·518 | 1·904 |
| 6th 4 f.ʒ | 63·53 | 3 617 | ·723 | 57·41 | 3·301 | ·660 | 40·75 | 2·353 | ·471 | 109·09 | 6·603 | 1·321 |
| 7th 4 f.ʒ | 30 37 | 1·729 | ·346 | 32·41 | 1,863 | ·373 | 22·60 | 1·305 | ·261 | 123 90 | 7·500 | 1·500 |
| 8th 4 f.ʒ | 17·59 | 1 002 | ·200 | 21·30 | 1·225 | ·245 | 16·85 | ·973 | ·195 | 77·42 | 4 686 | ·937 |
| 2d pint. | 267·44 | 15 230 | 3·046 | 219·10 | 12·598 | 2 520 | 166·88 | 9·601 | 1·92 | 467·65 | 28 307 | 5·661 |
| 9th 4 f.ʒ | 12·41 | .706 | ·141 | 15·74 | ·905 | ·181 | 11·67 | ·674 | ·135 | 48·52 | 2 937 | ·587 |
| 10th 4 f.ʒ | 10·37 | ·590 | .118 | 10·19 | ·586 | ·117 | 9·44 | ·544 | ·109 | 24·45 | 1·480 | ·296 |
| 11th 4 f.ʒ | 8·70 | ·500 | ·100 | 8·71 | ·500 | ·100 | 6.30 | ·363 | ·073 | 15 56 | ·942 | ·188 |
| 12th 4 f.ʒ | 6·11 | ·348 | ·069 | 7·96 | ·458 | ·092 | 5 93 | ·342 | ·068 | 11·85 | ·717 | ·143 |
| 3d pint. | 37·59 | 2·141 | ·428 | 42·60 | 2·449 | ·490 | 33 34 | 1·923 | ·385 | 100·38 | 6 076 | 1·215 |
| 13th 4 f.ʒ | 5·74 | ·326 | 0·65 | 6·30 | ·362 | ·072 | 5·74 | ·331 | 066 | 10·37 | ·628 | ·126 |
| 14th 4 f.ʒ | 3·89 | ·221 | ·044 | 5·74 | ·324 | ·065 | 5·00 | ·289 | ·058 | 8·33 | ·504 | ·101 |
| 15th 4 f.ʒ | 2·96 | ·169 | 044 | 4 82 | ·277 | ·055 | 4·44 | ·256 | ·051 | 7·78 | ·471 | ·094 |
| 16th 4 f.ʒ | 3·52 | ·200 | ·040 | 4·07 | ·230 | ·046 | 4 07 | ·235 | ·047 | 6·85 | ·415 | ·083 |
| 4th pint. | 16·11 | ·917 | ·183 | 20·93 | 1·193 | ·240 | 19·25 | 1·111 | ·222 | 34·33 | 2 018 | ·404 |
| Total····· | 1756·36 | | | 1738·91 | | | 1732·50 | | | 1652·31 | | |

late. This latter is assumed to be a fair index of the real value of each portion of the percolate. And if it be not a fair index, the error is on the safe side for practical results, as it always should be where accuracy cannot be attained. The medicinal value given in this column is calculated upon the whole amount of the extract yielded, and the numbers therefore indicate also so many twentieths of the total medicinal value. For example, the first four fluidounces of percolate of Experiment I. contains six and two hundred and ten one thousandths per cent. of extract that is medicinal and useful; or six

and two hundred and ten thousandths twentieths ($\frac{6}{20}\frac{2}{0}\frac{1}{0}$=31·051 per cent.) of the whole medicinal part of the extract. Hence, the second column, which gives the percentage of the total extract, inert and medicinal together, also indicates the percentage of medicinal extract alone, since a percentage is the same, whether calculated upon the 1756 grains of total extract, inert and medicinal together, or upon the 351 grains of medicinal extract alone, if the ratios be preserved.

It will be seen by this table, that the proportion of menstruum adopted by the Pharmacopœia for moistening the powder before packing is not the best. Secondly, That there is a remarkable difference in different lots of good bark, both in the progress of exhaustion and, as noticed before, in the character of the percolate in regard to the tendency to deposit less soluble matters, whilst the total amount of extract yielded and the proportion of alkaloids may not vary widely. Length of time seems to have much to do with this tendency to deposit, and possibly may account for the whole difference in this way. The new bark was in very fine powder, and was packed about as tightly in the percolator as the old. This caused it to percolate much more slowly; indeed, it percolated extremely slow,—was more than 48 hours in starting, and then gave about eight fluidounces in 24 hours. Under these circumstances, we may suppose that the menstruum, which became saturated with the less soluble matters, had time to deposit them again before escaping as percolate. The percolate might thus remain clear, as this did, and this process of solution, deposition, and resolution in the mass, would naturally postpone the final exhaustion of the powder, and distribute the extract obtained through a larger portion of the percolate, without materially affecting the total amount of extract, as really happened in the case of this bark, let the cause be what it may. These conditions and circumstances would not obtain in any known case, except that of cinchona bark, and therefore this is a good example of the most precarious and unfavorable application of economical percolation. Thirdly, That under ordinary favorable circumstances, the first 12 fluidounces, or the reserved percolate in calisaya bark, contains over 75 per cent. of its total value; the first pint over 86 per cent., and the

first two pints over 96 per cent.; and that the remainder is very dearly obtained at the expense of two pints of menstruum. And, finally, other percolations of these barks, in connection with those recorded here, show that slight variations in management do not materially interfere with the uniformity of the general results.

Starting from these experiments with colchicum seed and calisaya bark, thus studied out in detail with care, other drugs were extracted by percolation in a similar way. These were Nux Vomica, Gentian, Alexandria Senna, Short-leaved Buchu, and Cimicifuga. The writer has neither time nor opportunity for a series of details in connection with these drugs, such as would be interesting and might be useful, but must be contented with giving the results of the fractional percolations in a tabular form. This is the less to be regretted since any one can draw the deductions from the facts when stated. For convenience of review, the corresponding results from the tables of colchicum seed and calisaya bark are recapitulated in this general table:

TABLE III.

*General Results of Officinal Percolations.*

| Drug Represented. — Quantity used. Sixteen troyounces, or 7680 grains. | Menstruum used. | Total mesure of percolate directed and obtained. | Total number of grains of dry extract contained in the total percolate. | Percentage of dry extract yielded by the drug to the officinal process. | Percentage of the total extract contained in the first 8 fluid-ounces of percolate. | Percentage of the total extract contained in the first 12 fluid-ounces of percolate. | Percentage of the total extract contained in the first pint of percolate. |
|---|---|---|---|---|---|---|---|
| Nux Vomica | Alcohol | 60 fluid ozs. | 866 | 11 | 54 | 66 | 72 |
| Colchicum Seed | 2 measures Alcohol, 1 " Water | 44 " | 1417 | 18 | 52 | 67 | 76 |
| Short-leaved Buchu | Alcohol | 44 " | 1024 | 13 | 50 | 62 | 71 |
| Alexandria Senna | Diluted Alcohol | 48 " | 2384 | 31 | 47 | 64 | 76 |
| Cimicifuga | Alcohol | 24 " | 524 | 7 | 63 | 74 | 82 |
| Cimicifuga | Diluted Alcohol | 32 " | 884 | 12 | 59 | 78 | 83 |
| Gentian | Diluted Alcohol | 44 " | 2573 | 33 | 43 | 61 | 77 |
| Calisaya Bark | Diluted Alcohol | 64 " | 1739 | 23 | 53 | 73 | 84 |
| Do. do. New, slowly percolated | Diluted Alcohol | 64 " | 1652 | 22 | 39 | 52 | 64 |

The drugs selected afford examples which embrace all the important differences of condition met with in the Pharmacopœia; and those most difficult to manage were preferred. Thus, two examples of seeds were selected: one wherein alcohol is directed as the menstruum; the other, a mixture of alcohol and water. Two examples of leaves: one requiring strong alcohol, the other diluted alcohol. Two examples of roots: one requiring both strong and diluted alcohol, the other diluted alcohol. One example of bark was considered sufficient, as it is the most difficult of all to manage well.

The quantities used were strictly those of the officinal formulas; and the menstrua, and management, and the extent to which the percolations were carried, were also strictly officinal.

In conclusion, it may be confidently stated, that a very great and important economy in the use of alcohol in percolation may be effected by changing the officinal formulas which apply to the drugs experimented upon for this paper. And it may be fairly inferred, from these experiments, that this economy might be applied to all other percolations of officinal drugs. Should the Committee on Revision of the U. S. Pharmacopœia think the subject of sufficient importance to warrant a change in the officinal standard before the next decennial revision of 1870, or, practically, say 1872, we shall doubtless hear from that Committee on the subject.

Should we not hear from them in a legitimate and authoritative way, the writer of this paper earnestly forbids the use of the results here given, as indicating any short cut or justifiable economy whereby the officinal formulas are to be evaded or substituted. There can be but one standard, and there can be but one kind of honesty to that standard, namely, faithful obedience and truthful accuracy.

*Brooklyn, September*, 1865.

## AN AUTOMATIC VACUUM APPARATUS.

By N. Gray Bartlett.

It is highly probable that, had the framers of our national Pharmacopœia foreseen the enhanced value of alcohol, many of the officinal formulas would have been greatly modified, to insure a more economical use of this important menstruum; and in no instance would this modification be more apparent than in the mode and temperature prescribed for the evaporation of spirituous liquids.

These defects have been the means of defeating, to some extent, the objects of the Pharmacopœia; the pharmaceutist, if he relinquish the preparation of those articles involving a great waste of alcohol, and purchase them of the wholesale manufacturer, neglects one of the most important duties of his avocation, while, if he ignore the authoritative directions in this respect, he establishes a most reprehensible precedent, an act not excusable by the plausible plea that equally efficient preparations are secured by this *alternative*.

The presumption is not unfounded; indeed, it is the conviction of the writer that, as a general rule, spirituous solutions of organic matter evaporated at 120°, 140°, or 160°, and, necessarily long exposed to the combined influences of heat and air, suffer greater injury than would ensue from the use of the water-bath still, the difference of temperature being more than compensated for by the exclusion of the atmosphere and the rapid concentration of the liquid.

Vacuum evaporation, which effectually precludes all danger of oxidation and of injury by an excessive degree of heat, is generally acknowledged to furnish products far superior to those otherwise obtained.

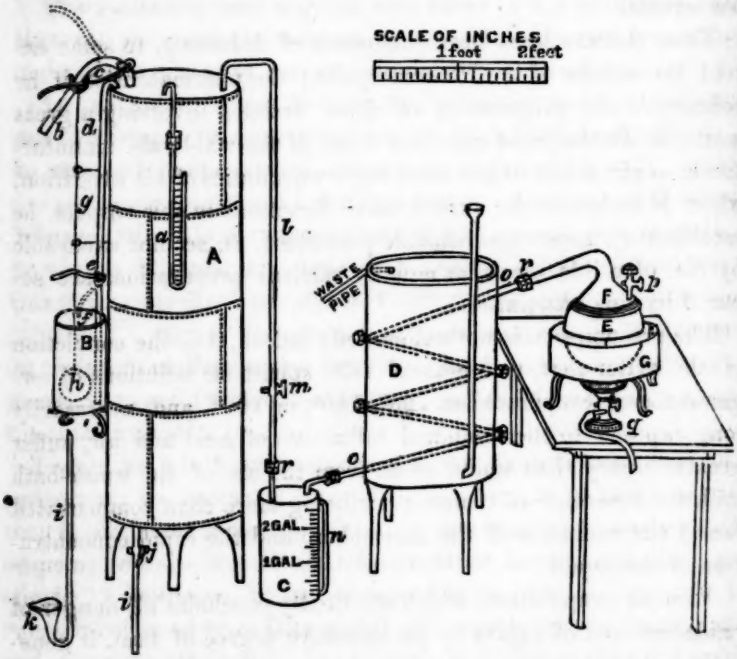
To secure this desideratum by the apparatus at present in use is attended, in addition to the large original outlay, with constant expense; as a consequence it is available only to the extensive manufacturer.

It is the object of this paper to call attention to a new form of vacuum apparatus, one which, it is believed, will recommend it-

self for its simplicity, its comparatively small cost, its automatic action and its inexpensive operation.

This plan was devised by the writer several years since, but it is proper to remark that it has never been put into actual practice.

The peculiarity of the method consists in the means employed for effecting the exhaustion; it is founded upon the well known principle of the Torricellian vacuum. Substitute for the barometric tube of thirty-four inches, one of water of as many feet,




| | Dimensions in inches. | Capacity in gallons. |
|---|---|---|
| *A*—Vacuum chamber | 18X60 | 66·09 |
| *B*—Reservoir | 7·5X13 | 2·48 |
| *C*—Receiver | 8X13·75 | 2·99 |
| *D*—Condenser | 18X28 | |
| *E*—Still, with an eight inch opening | Diameter 11 | 2·82 |

*F*—Still head. *G*—Water-bath. *a*—Vacuum guage; a bent glass tube communicating with the vacuum chamber. The closed limb is completely filled with mercury, which also slightly ascends into the other limb. Behind the tube is a scale of inches. *b*—Hydrant pipe. *c*—Stopcock, actuated by the float. *d*—Pipe allowing the egress of the air from the vacuum chamber, and also the escape of surplus water into the reservoir. *e*—Stopcock, closed by a spring attached to the rod, *g*. *f*—Spring. *g*—Rod connected with the float. *h*—Float. *i*—Pipe issuing from the bottom of the vacuum chamber. It is provided with a stopcock, (*j*) and is thirty-six feet long; its lower extremity being turned upwards and surmounted by the funnel, *k*. *j*—Stopcock. *k*—Funnel-shaped vessel, furnished with a spout. *l*—Tube connecting the vacuum chamber with the receiver. *m*—Stopcock. *n*—Glass guage tube, showing the height of liquid within the receiver. *oo*—Condensing tube. *p*—Stopcock. *q*—Gas-burner. *rr*—Connection couplings.

expand its closed extremity to a larger chamber, and the discovery of Torricelli is again available for a practical use.

By consulting the annexed drawing and references, the apparatus will be readily understood; its operation is as follows:

The stopcock, *j*, being closed, cocks, *c* and *e*, are opened, (as shown in the drawing) and water enters from the hydrant pipe, *b*. When the vacuum chamber has become full, water flows through the pipe, *d*, into the reservoir, where it raises the float, *h*, and shuts the cock, *c*. The liquid to be evaporated having been introduced into the still, and the connections being properly made, cocks, *j* and *m*, are opened. The water immediately descends through the pipe, *i*, and at the same time it enters the vacuum chamber from the reservoir; the float, meanwhile, falls, leaving the cock, *c*, closed, (as shown by the dotted lines) and carrying with it the rod, *g*. The spring, *f*, in its descent, fastens upon the lever of the cock, *e*, closing it, (shown by dotted lines.)

Heat is now applied to the water-bath, and, after the lapse of a few minutes, the stopcock, *m*, is shut. A plentiful supply of cold water is made to circulate through the condenser, until the completion of the process.

The flow of water, when admitted to the vacuum chamber, is regulated by the "ball-cock" contrivance, which allows the vessel to be kept constantly full and ready for use, without attention. The reservoir, while it serves as a cistern for the float, provides for the filling of the pipe, *i*, at the commencement of the operation, without the admission of air to the vacuum chamber. When the cock, *j*, is opened, water ascends the pipe, *d*, on the principle of the syphon, and, as the capacity of the reservoir is about double that of the pipe, *i*, the latter will have been completely filled before the cock, *e*, is closed by the fall of the float.

The pipe, *i*, being full, the water will escape until it reaches a height corresponding to the atmospheric pressure; this point is, however, some distance below the vacuum chamber, as the column of water, thus supported, would rarely exceed thirty-four feet. An absolute vacuum is not obtained by this means, because of the ready diffusibility of aqueous vapor, and the escape of air and absorbed gases, from the water.

It was feared that the large amount of carbonic acid gas frequently present in this fluid would render it necessary to intro-

duce some absorbent into the vacuum chamber. It was observed, however, that no material depression of the mercurial column arose from this cause; a fact sufficiently explained by the supposition that the escape of the water is so rapid that none of its gaseous constituents can be disengaged.

The confined air diffuses itself throughout the entire apparatus, and as the capacity of the vacuum chamber is ten times that of the still, condensing pipe and receiver combined, but one-eleventh of the original atmospheric pressure is present; a repetition of the process would increase the tenuity of the air to 121 times that of its normal condition.

As the temperature of the water furnished to our cities probably never exceeds 75°, and the tension of its vapor at this degree of heat is equal to but ·85° of an inch of mercury, this contrivance is capable, under the most unfavorable circumstances, of producing a degree of exhaustion expressed by less than one inch of mercury.

The vacuum is maintained by the condensation of the vapor proceeding from the still, by an ample supply of cold water to the condenser. If the connections be perfect, distillation will proceed so long as the proper difference in the temperature of the still and condenser is preserved.

The guage-tube of the receiver shows the quantity of the distillate, which indicates approximately when the process should cease.

The still could be made more covenient by the addition of a syphon tube to the cock, *p*, for the purpose of introducing more liquid without destroying the vacuum; a "proof-stick" and a thermometer might be inserted with equal advantage. By employing two vacuum chambers, and a suitable arrangement of floats and valves, the process could be rendered continuous and entirely automatic.

This apparatus would be particularly applicable to the wants of the manufacturing pharmaceutist.

The fact that it can only be advantageously employed in those localities where water works exist, detracts somewhat from its utility.

*Chicago, Ill., August*, 1865.

*Proc. of the Amer. Pharm. Asso.*, 1865.

## ON THE MANUFACTURE OF COMMERCIAL CARBONATE OF AMMONIA.

By J. Carter Bell, F.C.S., Associate of the Royal School of Mines.

This salt must have been known even to the alchemists, as it forms one of the chief constituents of putrid urine, but there seems to be no evidence that it was manufactured previously to this century; indeed, one would hardly think that they knew the difference between ammonia and its carbonate. The real difference was first pointed out by Dr. Black, of Edinburgh.

Carbonate of ammonia is formed by the putrefaction of animal substances, and by the destructive distillation of animal matter.

In the destructive distillation of bones, carbonate of ammonia is produced, and also water with the oil called "Dippel's oil," with some incondensable gases. The condensed liquors from the carbonization of bones separate in two distinct forms —the oily and the aqueous products—the latter containing the carbonate of ammonia; the salt can be separated by sublimation.

Many processes have been tried for the manufacture of this compound. I am informed by Mr. John Hogarth (who has been engaged in this chemical operation for forty years) that in the year 1825 a Mr. Holmes manufactured this salt in the old Haymarket, Liverpool; it was made from stale urine, and the resulting blocks were very small, weighing about six pounds. At the present time the weight of a block is about two hundredweight.

On March 11, 1844, Dr. Wilton Turner took out a patent for obtaining salts of ammonia from guano. The guano is subjected to a destructive distillation in close vessels at a low red heat during the greater part of the operation, but the temperature is increased towards the end. The products of distillation are collected in a series of Woulfe's bottles, by means of which the gases evolved during the operation may be made to pass two or three times through water before escaping into the air. The products consist of carbonate of ammonia, hydrocyanic acid, and carburetted hydrogen; the first and second

are rapidly absorbed by the water, with the formation of a strong solution of hydrocyanate and carbonate of ammonia.

In 1849 Mr. Hills took out a patent for obtaining carbonate of ammonia from guano. To effect this the guano is first mixed with charcoal or powdered coke; the mixture is then heated, and the carbonate obtained by sublimation. Peat has been experimented on for the production of this salt; whether it will be an economical process remains to be proved. Mr. Hills took out a patent for obtaining ammonia from peat, and Mr. Rees Reece in 1849 also had a patent very much like Mr. Hills'. The first part of the patent is for an invention for causing peat to be burned in a furnace by the aid of a blast, so as to obtain inflammable gases, tarry and other products. The tarry products may be employed to obtain paraffine and oils for lubricating machinery, &c., and the other products may be made available for evolving ammonia, wood spirit, and other matters by any of the existing processes. On July 27, 1849, a statement was made in the House of Commons to the effect that 100 tons of peat would produce 2602 pounds of carbonate of ammonia.

In 1841 Mr. Laming took out a patent for manufacturing carbonate of ammonia by mixing its separate acid and alkaline constituent, instead of by the decomposition of ammoniacal salt. One of the processes used is to cause ammonia and carbonic acid gas obtained separately from any convenient sources to traverse a succession of leaden chambers maintained at as cool a temperature as may be conveniently practicable, and so continued as to favor the admixture of the dissimilar gases. In this process it is not essential that the two gases be present in their combining proportions; it is preferable that the carbonic acid be in greater abundance than will combine with the ammonia which is present. Sometimes a stratum of water, or of water impregnated with ammonia, is placed in one or more of the leaden chambers. Carbonic acid and ammonia in the form of gas are then introduced; in which case, it is stated, a larger proportion of carbonic acid gas is found in the resulting salt, or saline solution, than when only the hygrometric moisture of the aëriform fluid is present. Mr. Laming also converts

the hydrosulphate of ammonia contained in gas liquors into carbonate of ammonia by the following process:—A mixture of deutoxide of copper and charcoal, or other form of carbon in fine powder, in the proportion of twelve parts by weight of the former to one of the latter, is introduced into a retort made red hot and furnished with an eduction pipe which passes through cold water and finally enters into the gas liquor. The formation of carbonic acid gas soon takes place by the union of the carbon with the oxygen of the metal, and this gas combining with the base of the hydrosulphate of ammonia converts it into carbonate, with liberation of sulphide of hydrogen. When the carbonic acid ceases to come away, nearly all the carbon will have disappeared from the retort, and the oxide of copper reduced to the metallic state. The charge is then drawn, and left to cool while a second charge of similar materials is being worked off; during which time the copper reabsorbs oxygen from the air, and becomes again deutoxide of copper, which may be used anew with fresh carbon.

Messrs. Crane and Tullien, in their patent of January 8, 1848, describe a method of manufacturing ammonia in the state of carbonate, hydrocyanate, or free ammonia by passing any of the oxygen compounds of nitrogen, together with any compound of hydrogen and carbon, or any mixture of hydrogen with a compound of carbon, through a tube or pipe containing any catalytic or contact substance. The substance which is preferred is platinum in the state of sponge, or asbestos coated with platinum. This is to be placed in a tube and heated to about 600° F., so as to reduce the temperature of the product, and at the same time prevent the deposition of carbonate of ammonia, which passes onward to a vessel of the description well known and employed for the purpose of condensing carbonate of ammonia. The condenser for this purpose must be furnished with a safety pipe, to allow the escape of uncondensed matter, and made to dip into a solution of any substance capable of combining with hydrocyanic acid or ammonia.

Carbonate of ammonia is manufactured at the present time from a mixture of sulphate or chloride of ammonium and

common chalk, heated in retorts and sublimed. The decomposition of the chloride of ammonium may be represented thus:—

$$(3H_4N,Cl)+_3(CaO,CO_2)=3CaCl+_2H_4NO,3CO_2+H_3N+HO.$$

In the manufacture of ammonia alum, the ammonia is derived from gas liquor; the liquor is heated, and nearly all the volatile ammonia driven off. The residue is taken out of the boilers and used for the manufacture of carbonate of ammonia. It is treated with a little acid till it is neutral, then evaporated by means of heat in large hemispherical iron pans set in brickwork. When it has arrived at the crystallizing point, it is allowed to cool, and crystals are then deposited; or the hot liquor may be run into other coolers for crystallization. The mother liquor is syphoned off, and then the inside of the pan is seen studded with intense black crystals, of the prismatic form when sulphuric acid has been used for the neutralization, and cubical with hydrochloric acid. The crystals are now shovelled out of the pan and washed with the mother liquor. They are then re-dissolved, the liquor run into coolers, and re-crystallized. In the re-dissolving a great deal of sediment is deposited, consisting chiefly of the matter mechanically locked up in the crystals. The crystals when dry are of a dirty white color; they are now ready for the next operation of converting them into carbonate of ammonia. For this purpose cast-iron retorts, the shape of an elongated muffle, are used. The neck of the retort is round, and closed with an iron door, kept in its place by means of a screw. The retorts are about seven feet long and one and a-half deep. Three are set in brickwork in the form of a triangle, and heated by one fire. They communicate by means of iron pipes with a leaden chamber which is technically called a balloon. It is about six feet high, eight long, and two and a-half wide. These balloons are supported upon scaffolding so as to be on a line with the retorts, and are kept in their places by means of iron bands. At the bottom of each balloon is a small pipe, which is always kept open to allow for the escape of steam, and water highly charged with carbonate of ammonia. There is a constant dropping from this pipe, which is collected in a pail, and re-sublimed. If this

pipe was not there, the pressure inside the balloon might cause it to be blown off the scaffolding. Great attention has to be paid to the heating of the retorts. If they were heated too strongly, most disastrous results might occur.

The retorts are charged once every twenty-four hours with a mixture of carbonate of lime and ammoniacal salt; the chalk is well dried on an iron plate which is set over the flue, so that the waste heat of the fires economically dessicates it. All the retorts are not charged at the same time, for often there are five and six sets; if they were, the labor would be too great, and a greater number of men would be required; but to do away with that difficulty one retort in each set is charged at the same hour every day; the first charging takes place at seven, the second at eleven, and the third at three, and by that time the whole of the retorts have been charged. The contents are frequently stirred up with long iron rods (which are pushed through holes made in the door of the retorts) to assist the decomposition. Before a new charge is put in, the pipes leading to the balloons are well cleaned out, as they are very liable to become stopped up. The used-up charge, which consists principally of chloride of calcium, is drawn out into an iron barrow and wheeled away to some waste ground; the new charge (which is generally two of chalk to one of the salt) and which has been carefully weighed and well mixed, is thrown quickly into the retort, the door is luted on, and then the retort is left for twenty-four hours, the contents receiving an occasional stir.

When the retorts have been worked for about fourteen days, the balloons are opened, and the impure carbonate is found as a thick crust lining all the sides; it is deposited in different colored layers, according to the impurity of the carbonate. The chief impurities will be carbonate of lime and chloride of calcium, which are carried over mechanically; the salt is well scraped down from the sides, and the balloon prepared for another fourteen days' operation. These balloons have to be of considerable size, or there will be much waste from the salt being carried off by the steam; in each balloon is a small test-hole, closed with a plug of wood; this is for telling how the

sublimation is going on. The impure carbonate is all collected and taken to the resublimation pans. The salt is put into iron tanks about sixteen feet long and two and a-half deep; they are wider at the bottom than at the top, being two feet seven inches at bottom and two feet at top. These tanks are closed with two plates of iron with four holes in each, about one foot in diameter and one foot apart from each other. Over every hole is placed a conical leaden vessel with a flat top. These vessels are formed of a sheet of lead, and the two ends are kept together by means of staples and wedges; a circular piece of lead is luted on the top of these receivers; the height of them is about two feet. The tanks are set in brickwork, with a fire-place at each end. They are charged every fortnight; a certain quantity of water is first put in, then the impure carbonate. The receivers are all luted on over their respective holes, and a small fire made at each end of the tank. Great care is required in regulating the temperature, because the heat must not be too high, as the salt sublimes from 120° to 130° Fahrenheit. In the end receiver is a small hole closed by a plug; on taking this out it can be seen whether the temperature is too high; if it is, the fires have to be damped. A thermometer is generally used, but some people prefer to trust to their own judgment. Instead of the tank and fires separate pots may be used, each one being surmounted by a leaden cap; these pots are either set in brickwork and heated by the flue of the retort furnace, or they may be set in a water bath. At the end of fourteen days the leaden receivers are lined with a thick crust of carbonate; they are taken down, and the lead stripped off; the outside of the block is rather dirty, it is well scraped, and then broken into pieces, packed in jars, and sent to the market. The leaden receivers are well washed and re-shaped. A small quantity of the residuary liquor is taken out of the tanks, but the chief part is left in, a fresh charge of carbonate is added, the receivers are luted on, and the operation goes on the same as before.

The greatest use which is made of this salt is by bakers and confectioners; it is largely employed in medicine and in the manufacture of smelling salts.—*Lond. Chem. News, Dec.* 29, 1865.

## EXTRACT OF COD LIVER.

[NOTE.—In the December number of the Pharmaceutical Journal, Dr. Attfield, of the Pharmaceutical Society's Laboratory, under the caption of "Analysis of a quack imposture," severely criticizes a preparation prepared in Paris and sold in London, called "*Oleo-Morrhuine or Saccharide of Cod Liver Oil*," which professes to be a saccharine powder imbued with cod liver oil in a state of minute division, and to be greatly more efficacious than cod liver oil. Dr. Attfield states that the powder contains no oil, and that he could not detect chlorine, bromine, iodine, phosphorus or sulphur, which the label alleges are ingredients, and believes it to be wholly lactine.

In the January number of the same Journal, is a communication from Dr. Le Thiere, the inventor of the preparation, to Dr. Attfield his critic, in which he asserts that sulphur, iodine, bromine and phosphorus are present, and that an authenticated analysis will be published. Dr. Attfield did well to expose this bold piece of quackery, but he may after all be mistaken in asserting the absence of all except the oil. The extract of cod livers, sold in the form of drageés and pills, appears to have some claims to merit, and was brought to the notice of the Pharmaceutical Society, at its meeting held Jan. 6, 1866, (see *Pharm. Jour.*, for January, 1866,) by Mr. Squire, who called the attention of the members to the composition of the watery extract of cod livers. "He had brought with him the extract resulting from the evaporation of the water which oozes out of cod's liver when extracting the oil. He finds that on the average 28 lbs. of large and fresh livers yield 12 lbs. of oil, and 2 ounces of aqueous extract resulting from the evaporation of the water. It has been represented in the advertisements of a medicine called '*Cod Liver Drageés*,' that five grains of the purified extract equal a tablespoonful of cod liver oil. It was this startling announcement that induced him to have the water collected and evaporated, in order that the members of the Society might examine the product and judge for themselves, and, if it was thought worth while, to have it analyzed in their laboratory. He thought it was highly important to know whether or not we were throwing away so valuable a part of the livers as this statement indicated."

A gentleman present explained that the "cod liver extract" was not a secret remedy, but was patented and read a specification.

Some discussion followed evidencing a disposition unfriendly to the preparation on the plea that it was not the business of the Pharmaceutical Society to expose nostrums or to make therapeutic experiments; notwithstanding this, we believe the subject worthy of consideration.

There are two views of the action of cod liver oil; one, that it proves curative through the agency of certain mineral and organic constituents, which are contained in cod livers and a portion of which are retained by the oil; the other, that cod liver oil itself has a great fitness for assimila-

tion, and acts through its tonic effect in the process of assimilation and nutrition. Some also believe it to unite these properties in its therapeutic action. Now, if it be true that the various principles which have been attributed to this oil are derived from the fluids of the hepatic organ, is it not probable that the pure oil itself, as secreted in the cells of the liver, is not imbued with them to much extent, and that it is only when the tissues are broken up in the extraction of the oil, that the latter assumes these ingredients? This at least is reasonable, and if these ingredients be really important, why should we not expect valuable curative results from an extract embracing the soluble constituents, not oleaginous, of the cod livers? The following paper referring to this subject is not satisfactory, but will serve to introduce the subject to our readers.—EDITOR AM. JOUR. PHARM.]

To the Editor of the CHEMICAL NEWS:

*Sir*,—Will you kindly grant me space in your columns for a few observations in reference to your necessarily brief report of the Pharmaceutical Society of the 6th inst., at which the claims of the new extract of cod livers were discussed? My apology for again intruding on you must be the general interest of the discovery that the watery constituents of cod liver, which have been hitherto deemed of no value, and thrown away, are really richer in medicinal substances than cod liver oil.

The 28 lbs. of cod liver from which Mr. Squire was only able to produce 1 lb. of aqueous matter must have lost much of their water before coming into his hands. The 15 lbs. of liver which remained after the withdrawal of the 12 lbs. of oil and 1 lb. of water evidently still contained much aqueous liquid.

The waters of cod liver, when skilfully obtained, constantly yield 15 per cent. of extract. Mr. Squire seemed to have got no more than 12 per cent.

The extract, when properly prepared, contains fully 78 per cent. of organic and inorganic matters (exclusive of oil); while cod liver oil, according to the best known analyses, contains only 1·024 per cent. Hence, in one tablespoonful of the latter, which comprises 240 grains, there are present scarcely $2\frac{1}{2}$ grains of the organic and inorganic matters of which the extract is almost entirely composed.

What is the chemical and medicinal nature of this extract? On the authority of the French analyses and official report, I assert that it is composed of the very substances—namely, fish-

bile constituents and inorganic elements which distinguish cod liver oil from all other animal oils and fats; and I challenge the Pharmaceutical Society to determine by analysis the value of that assertion. To this the Society reply, that although they consider it their duty to undertake the analysis of such preparations as would appear to come short of the pretensions of their authors, it is no concern of theirs to analyze those that seem likely to prove genuine; in other words, their province is to condemn, but never to approve! It was meritorious in them to proclaim to the world by Dr. Attfeld that Le Thière's "cod liver oil powder" was an imposture, because it contained no traces of chlorine, iodine, bromine, sulphur and phosphorus; but it would be contrary to their policy to undertake an analysis which might result in showing that Guffroy's cod liver extract was a product peculiarly rich in those and other important bodies.

With regard to that part of the subject which was admitted to be wholly beyond the province of the Pharmaceutical Society—namely, the remedial properties of the extract, I must protest against the unfairness of the proposal made by the Chairman, Mr. Hills, that an individual member of the Pharmaceutical Society (Mr. Squire) who, as well as Mr. Hills, is a manufacturer and vendor of cod liver oil, should "induce a medical friend to make some experiments with the extract, and report to the Society."

Mr. Squire's medical friend to experiment in private with cod liver extract privately prepared by that gentleman, who has only recently heard of the substance, and is evidently not master of the process of making it, in order that the Pharmaceutical Society might arrive at a knowledge of the medicinal value of the extract prepared by M. Guffroy, who has devoted six years to the practical study of the subject. ! ! !

But the medical experiments suggested by Mr. Hills have already been made. Not to mention those that have been going on for five years on the Continent, extensive trials of Guffroy's dragées of cod liver extract have, during the last six months, been made in London. At St. Mark's Hospital, where my request for experiments with the extract was received in a liberal spirit by Mr. Gowland, one of the surgeons of that institution,

the new preparation has been distinctly proved by him to be so superior in remedial effects to cod liver oil, that for some considerable time back it has almost entirely superseded the oil in his practice in that hospital. This statement is open to verification by any one who chooses to make inquiries in the proper quarter.

If Messrs. Hills and Squire, who must have many friends among the hospital physicians and surgeons of London, will consent to procure further serious trials of Guffroy's extract in one or more of the large metropolitan institutions, I shall be much pleased; and I beg here to inform those gentlemen that I shall be ready to supply gratuitously sufficient prepared cod liver extract for the treatment of a large number of patients, provided the medical attendants will undertake to permit a medical gentlemen on my behalf to take part in the experiments, duly to record the cases, and to publish them in the medical journals.

I am, &c., JOHN BARR.

83 *Fleet Street, December* 27, 1865.

*Table Exhibiting the Comparative Composition of Cod-liver Oil and Cod-liver Extract.*

| | Cod-liver oil. | Cod-liver extr. |
|---|---|---|
| Oily acids and glycerin | 95·967 | none |
| Fish-bile constituents | 0·318 | 60·620 |
| Propylamina | occasional trace | 2·545 |
| Acetic, lactic, and butyric acids | 0·120 | 6·000 |
| Phosphorus and phosphoric acid | 0·113 | 2·090 |
| Sulphur and sulphuric acid | 0·071 | ·200 |
| Iodine | 0·037 | ·154 |
| Chlorine, with trace of bromine | 0·149 | 1·525 |
| Soda | 0·055 | 1·170 |
| Magnesia | 0·009 | ·366 |
| Lime | 0·152 | ·510 |
| Potash | none | ·211 |
| Ammonia | none | 2·862 |
| Water and loss | 3·009 | 21·847 |
| | 100·000 | 100·000 |

The extract is thus shown to contain 135 times as much of bile-constituents and other organic substances (exclusive of oily matter) as the oil, and 15 times as much of inorganic elements. Those two classes of bodies together form 78·153 per cent. of the extract, but only 1·024 of the oil. In a tablespoonful of the oil, which comprises 240 grains, there are therefore present hardly 2½ grains of the above matters, while the extract is almost wholly composed of them.—*London Chemical News, Jan.* 5, 1866.

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## PANCREATIC EMULSIONS.

Of all the new remedial agents which are now being employed by the medical profession, the Pancreatic Emulsions, introduced by Dr. Dobell, are perhaps the most noteworthy. Some time must elapse before their real value can be established; but the satisfactory results which have already been obtained with them in the treatment of consumption, will induce all physicians, who keep pace with the age, to give them a fair trial. Should they prove as useful as Dr. Dobell believes them to be, their introduction will be referred to with delight, by those who maintain that medicine can make but little progress until therapeutics and physiology are more firmly united. The Pancreatic Emulsions are rational remedies, and were devised to counteract the wasting effects of a morbid condition which Dr. Dobell detected in consumptive patients. Some years ago, Dr. Dobell's attention was directed to the fact, that many consumptive patients disliked fat, and the results of a careful examination of a series of cases which came under his notice at the Royal Infirmary for Diseases of the Chest, proved that this dislike for fat was common to the great majority. These results closely corresponded with those published directly afterwards by Mr. Jonathan Hutchinson, in a valuable suggestive paper, "On the form of Dyspepsia which often precedes and attends Phthisis." With a view of testing by direct experiment, whether this dislike for fat was due to some abnormal condition of the pancreatic secretion, Dr. Dobell determined to treat a series of cases of consumption with the pancreatic juice of the pig. After many tedious experiments, in which he was assisted by Mr. Heathorn, a rising

young chemist, an emulsion of beef-fat, with the pancreatic juice, was adopted as the most eligible preparation. This was supplied to the patients, who were ordered to take it stirred in milk. The emulsion could be mixed readily with the milk and in the proportion of half an ounce to a breakfast-cupful of milk, formed a drink that was not unpleasant. Twenty-four patients of the thirty-three treated with the emulsion, were discharged after eight weeks, in an improved condition with respect to their general symptoms. The emulsion disagreed with three patients only, whereas cod-liver oil disagreed with eleven out of the twenty-four to whom it was administered. A second series of cases were afterwards treated with the pancreatic emulsion of fat, or with a pancreatic emulsion of lard oil, and similar satisfactory results were obtained. Mr. Heathorn being prevented by his other engagements from preparing the emulsions in sufficient quantity to meet the increased demand produced by many medical men prescribing them, Dr. Dobell sought and obtained the valuable assistance of Mr. Schweitzer, the scientific chemist in the establishment of Messrs. Savory and Moore, and these preparations are now made by this celebrated firm. The principal preparations are: 1. Pancreatic emulsion of solid fat. 2. Pancreatic emulsion of cod-liver oil. 3. Pancreatic emulsion of lard-oil. The first of these appears to be the favorite remedy with the medical profession. It is a white paste of the consistence of thick Devonshire cream. It remains good for a long time, though the pancreatic juice, unmixed with fat, rapidly undergoes decomposition. The dose is from one to three teaspoonfuls, once or twice a day, in a cup of milk, to which a little brandy may be added. It is to be taken two hours after a full meal. A fourth preparation, recommended by Dr. Dobell, is Pancreatine in capsules or globules, but up to the present time, Messrs. Savory and Moore have been unable to find a suitable material for the capsules which will resist the action of the agent.

According to Claude Bernard, the great French physiologist, the pancreatic juice is the most important secretion of the digestive organs, and possesses the property of emulsifying fats, of transforming starch into sugar, and of acting on albuminous substances. Some physiologists do not adopt Bernard's view, but

all agree that the pancreatic juice helps to render fats easy of absorption.

The following extracts from one of Dr. Dobell's reports will show the value of any means for promoting the assimilation of fat in consumptive patients, and also explain the frequent failure of cod-liver oil to sustain the improved condition which so often occurs when it is first administered:—"According to the careful estimate of Dr. Lyon Playfair, the quantity of fat required by an adult in twenty-four hours, to keep up healthy nutrition, is from 1 oz. to 2·5 oz.; and according to the estimates made from numerous and carefully-selected data by Mr. Farrants and myself, the quantity is from 2 oz. to 3·5 oz. We may fairly assume, then, that not less than two ounces of fat per day, on an average, is required to keep up healthy nutrition in an adult. We have next to bear in mind that, before a case of consumption ordinarily attracts attention, and begins to be treated as such, many pounds weight, principally consisting of fat, have been gradually removed from the body. In this condition—1, a deficiency of fat throughout the organism; 2, a loss of the power to assimilate ordinary fats; 3, a constant demand for two ounces per day, to maintain the healthy nutrition,—we adminster cod-liver oil, in the belief that this form of fat will assimilate when other forms will not. Supposing that it agrees, and that some or all of it is utilized, a rapid improvement takes place in the patient, from the supply of some of that for want of which life was steadily fading—very much as a cut flower that has drooped for want of its supply of sap rallies and recovers freshness for a time when put into water. But there are very few persons who can take more than half an ounce to one ounce of oil per day—few who can even take this steadily from week to week without intermissions. But supposing an ounce or an ounce and a half per day to be taken regularly, how is this to supply, not only the two ounces per day required for healthy nutrition, but all the extra ounces of arrears that were lost before the treatment was begun? But assuming the possibility of two ounces per day of oil for nutrition, and another two ounces for arrears, being taken and utilized, even then the whole thing may be unstable and may break down, from the fact that we are supplying oil and not solid fat—a

body rich in olein and poor in stearin and margarin, in the place of bodies rich in stearin and margarin and poor in olein, such as the fats taken in normal food.

"The practical conclusion from these considerations appears to be, that if we are to give a fair chance of recovery to a patient deprived of the natural powers of digesting and assimilating fats, we must, by one means or another, secure that two ounces of fat of average solidity are utilized every day for the purposes of nutrition, and an additional ounce or two to make up for arrears."

If the pancreatic juice of the pig artificially introduced into the digestive apparatus does really cause a fair proportion of this amount of fat to be assimilated, the pig's "sweetbread" must be regarded as one of the most important articles of the Materia Medica. B.

*The Chemist and Druggist, Jan.* 15, 1866.

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## NOTES ON THE SOPHISTICATION OF RECTIFIED OIL OF AMBER, OLEUM SUCCINI RECTIFICATUM, U. S. P.

By Albert E. Ebert.

Having recently observed that a specimen of "rectified oil of amber" was insoluble in stronger alcohol, a further investigation of the subject was deemed desirable. The oil in question, upon a closer examination, was found to have none of the characteristics of the genuine article, as described in the books, but to bear a striking resemblance to "Kerosene," or some similar product obtained by the distillation of petroleum or bituminous coal. I procured several specimens of the oil, from different sources, with the idea of ascertaining the quality of it as found, at present, in the market.

None of these samples bore any analogy to the genuine oil, but appeared to be sophistications. Two of the five samples I obtained corresponded with the original specimen in resemblance to Kerosene while an equal number appeared to be merely resinified oil of turpentine. These latter specimens were obtained from dispensing Pharmaceutists, while the remaining ones ("Kerosene variety") were furnished by reliable wholesale

druggists. The fifth sample was represented to me as a genuine article of crude oil of amber, and as it appeared to have some of the properties of the true oil, I determined to prepare from it the rectified article.

It was a thick, dark colored liquid, with an empyreumatic tarry odor, partially soluble in stronger alcohol, and having the sp. gr. 1·045 at 60° F. I subjected sixteen fluidounces of this commercial crude oil in a glass retort to distillation, with the requisite quantity of water, as directed by the U. S. P. After distilling over nearly all the water, I found that the yield of rectified oil was not quite two fluid drachms, although the mixture had been kept at a constant boiling temperature. This result led me to think that either by a previous distillation it had been deprived of its essential oil, or that it was an adulterated article. I procured 2lbs. av. of amber ("Succinum,") which was first subjected to an examination and found to be a true article.

It was mixed with an equal weight of sand, placed in an iron retort, and subjected to heat. Vapors of a white color were abundantly evolved, which, when inhaled, excited coughing. These vapors, when passed through water, were dissolved, and the solution, after concentration, deposited crystals of succinic acid. The oil soon came over quite rapidly, the first portion of a yellowish color, which was followed by a thick, dark colored liquid; heat was continued until volatile matter ceased to pass over.

From twenty-nine troyounces of the resin I obtained twenty-one fluidounces of crude oil of a very dark color, having a strong succinic, empyreumatic odor, and the sp. gr. ·985 at 60° F. Twenty fluidounces of this crude oil were mixed with seven and a-half pints of water placed in a glass retort, heat applied through means of a sand bath, and distilled until five pints of the water with the oil had passed over into the receiver. I would here remark that, to maintain the mixture at a constant boiling temperature, in a glass distillatory vessel, I found it necessary to cover the head and neck of the retort with a tin hood, thereby retaining the heat. When this is not observed, the yield of the volatile oil will be considerably

smaller. The oil, when separated from the water, measured two and a-half fluidounces, (12½ per cent.) This is the Oleum Succini Rectificatum (U. S. P.) having an amber color, and the peculiar succinic odor, sp. gr. ·903 at 60° F., beginning to boil at 339° F. and its temperature continuing to rise to 367° F., soluble in alcohol to a limited extent, but dissolving in all proportions in chloroform, ether, bisulphuret of carbon, and the fixed oils. The residue left in the retort after the distillation of the rectified oil of amber, (U. S. P.) was of a brown color, sp. gr. 1·019 at 60° F., having the consistence of simple syrup, and possessing to a marked degree the odor of the oil of amber; it was partially soluble in stronger alcohol. This residue had, to a marked extent, a resemblance to the commercial article sold as crude oil of amber.

The annexed table shows the properties of, and the action of reagents upon the several oils examined. (See page 149.)

The conclusions based upon the foregoing experiments are, first, that rectified oil of amber is extremely scarce, if not entirely absent from the market; secondly, that the articles sold as such are Kerosene, modified, perhaps, by heat, and resinified oil of turpentine.

I observed that Kerosene, when heated to 360° F. and upwards, lost much of its coaly odor, acquired an amber color, and was rendered very similar in appearance to the commercial rectified oil of amber, as seen by sample upon the table, and that the change became more apparent with an increase of heat, as seen by another sample. The commercial oil, under the same conditions, suffered similar changes.

This Kerosene variety, when exposed to direct sun-light, is distinctly opalescent, and it is further distinguished from the genuine oil by its insolubility in alcohol, and the absence of a resinous body when treated with nitric acid. It is inferred that this variety represents the article now furnished to the trade, as the remaining samples were from dispensing establishments where they had long been in stock. The latter variety, (turpentine,) is sufficiently distinguished by its odor, and violent fulminating action with iodine.

The product of the oxidation of forty grains of true oil of

| | Rectified Oil of Amber. U. S. P. | Commercial Rectified Oil of Amber. *Two samples*, resembling Kerosene in physical properties, having similar deportment with reagents. | Commercial Rectified Oil of Amber. *Two samples*, having the characteristic properties of *Oil of Turpentine*. |
|---|---|---|---|
| **PHYSICAL PROPERTIES.** | | | |
| Sp. gr. at 60° F | ·903 | No. 1. 823 / No. 2. 831 | No. 1. 878 / No. 2. 895 |
| Boiling point. | 339° F. | No. 1. 228° F. / No. 2. 292° F. | No. 1. 303° F. / No. 2. 312° F. |
| Solubil'y in stronger alcohol. Sp. g. 817 at 60° F. | 1 part of oil in 4 parts alcohol. | Not soluble; forming when shaken together a milky mixture, the oil separating on standing, and sinking to the bottom of the vessel. | No. 1: 1 part oil in 3 parts alcohol. No. 2: 1 part oil in 4 parts alcohol. |
| Solubility in alcohol. Sp. gr. 835 at 60° F. | 1 part of oil in 17 parts alcohol. | Not soluble. | 1 part oil in 8½ parts alcohol. |
| **ACTIONS WITH REAGENTS.** | | | |
| Bromine. | Very violent reaction, giving off white fumes, the liquid changing in color from a pink to a purple, then to a green, and ultimately to a brown, forming a uniform mixture. | Violent reaction, with effervescence and generation of white fumes, the bromine dissolving slightly in the oil, precipitating a little brownish resinous matter, forming two layers. | Violent fulmination, with evolution of white fumes; much of the oil was thrown out of the dish. On the addition of more bromine, the same action was observed |
| Maisch's Solution Bromine. | No violent reaction, forming two strata, the lower layer passing through the different shades of pink, purple and a reddish-brown. | The solution of bromine sinking to the bottom, producing no perceptible change on the supernatant oil. | Evolving white fumes, forming two layers, the upper being of a pink, and changing to a green color, the lower stratum, at first of a purple, becoming dark brown on standing. |
| Iodine. | Without any visible reaction, forming a dark brown thick liquid, with a slight deposit, which is afterwards dissolved in the upper stratum. | Soluble only to a very slight extent, the oil assuming a pale red color, gradually changing to a dark brown. | Fulminates with energy, giving off violet vapors, the temperature rising from 72° F. to 152° F. (80 deg.), the oil changing in color to a reddish-brown, with a precipitate of a soft dark brown mass, emitting a terebinthinaceous and empyreumatic odor. |
| Maisch's Solution Iodine. | On the addition of the etherial solution to the oil, a spreading of the mixture is produced, which extends to the rim of the crystal, returning to the centre, leaving undulating lines on the sides of the crystal. On standing, it forms two layers—the upper of a reddish brown color, the lower dark brown, of a thick consistence. | Producing also a spreading, but with circular wavy lines, the upper stratum being of a light red, and the lower of a dark brown color. | No violent reaction, and but little spreading, the solution settling to the bottom of the crystal having acquired a dark brown color, the upper stratum having a light red color. |
| Sulphuric Acid. | Producing a deposit of a reddish brown color, having a resinous appearance. | It only imparts to the acid which sinks to the bottom of the crystal a reddish brown color, with comparatively little deposit. | Emitting white fumes of a terebinthinous odor, the acid forming with the oil a compound of a reddish-brown color. |
| Hydrochloric Acid. | Forming two layers, the oil assuming a reddish color on standing. | No change in color. | Forms two layers, the oil changing to a yellowish green color; when mixed together by agitation, a milky mixture is produced. |
| Nitric Acid. | Changing the oil at first to a red, which becomes darker in color. On standing some time, a large quantity of a brown resinous matter is formed on the surface. | No change in color is perceptible. After standing 24 hours, a film is produced of a light yellowish color, floating on the surface of the mixture. | No change at first, but after standing 24 hours a light brown color is produced, forming two layers. |

amber, by one hundred grains of nitric acid, weighed thirty-four grains. This substance was partially soluble in alcohol, wholly so in liquor potassæ, from which it was precipitated by a dilute acid.

When dry it had the sp. gr. 1·103, broke with a resinous fracture, and was readily reduced to powder. This is the article described as "artificial musk," but it possessed none of the odor of that substance. Although well washed, it still retained a strong nitrous odor.

NOTE.—Since writing the above, I have been led into the "secrets of the trade" by one of the "initiated," who informs me that the "rectified oil of amber" is prepared by agitating turpentine with the crude oil, until the desired shade of color is acquired, when it is separated and offered for sale. As turpentine has been rather expensive of late, it would appear that some ingenious individual has improved this process, at the same time increasing the profits, by simply substituting Kerosene for the turpentine, and proceeding "*Secundum Artem.*"—*Proc. of Amer. Pharm. Asso.*, 1865.

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## ELIXIR OF VALERIANATE OF AMMONIA.

By J. FARIS MOORE.

Mr. Joseph Roberts, of Baltimore, having failed to reply to the Query, the following formula is presented as a simple mode of preparing the elixir, which has given satisfaction, and has been adopted by the Maryland College of Pharmacy.

Take of Valerianic acid, one fluidounce;
Distilled water, twenty-four fluidounces;
Carbonate of Ammonia, a sufficient quantity;
Inodorous Alcohol, twelve fluidounces;
Simple Syrup, twelve fluidounces;
Peach water, eight fluidounces;
Saturated tinct. of Red Saunders, four fluidrachms;
Saturated tinct. of recent Orange Peel, one fluidounce;
Oil of Bitter Almonds, five minims;
Oil of Sweet Orange, twenty minims;
Caramel, a sufficient quantity.

Mix the valerianic acid and the distilled water, and add a sufficient quantity of carbonate of ammonia to saturate the acid; then add the other ingredients, with a sufficient quantity of caramel to impart a brownish shade to the mixture, and filter through paper.—*Proc. Am. Pharm. Assoc.*, 1865.

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## ON THE PRESERVATION AND DISPENSING OF OINTMENTS AND CERATES.

By William Silver Thompson.

"What are the best vessels in which to dispense ointments and cerates, combining fitness with elegance and accuracy?"

The vessels in most common use for dispensing ointments and cerates, are the common jar and gallipot of eathenware; being convenient and readily obtained, they answer the purpose when the ointment is intended for immediate use only, but the great objection to the material of which these vessels are composed is its porous nature, the glazing not being perfect enough to prevent the absorption of the fatty matter into the body of the jar.

The common turned wood box answers a good purpose for dispensing the ordinary ointments and cerates, and on the score of economy will no doubt continue to be used unless superseded by something quite as cheap, and less objectionable. The difficulty often experienced in pasting the label on the turned box, owing to the porous nature of the wood, is entirely obviated by the application of two or three coats of acetous mucilage or liquid glue, by means of which the pores of the wood are filled and a smooth surface is prepared for the label.

The best vessels in which to dispense ointments and cerates, combining all the requisites of fitness, elegance and accuracy, are undoubtedly of glass. For ointments of very soft consistence, nearly approaching the nature of liniments, a wide mouth vial, fitted with a good cork stopper, answers a good purpose. For ointments of firm consistence and cerates, the flat jar of glass, with accurately fitting cover, made by the New England Glass Company, and probably by other factories, answers every requirement, where the expense of such a vessel is not an objection; and it would probably be brought into general use, if it could be furnished by the manufacturers at a lower price.

Since accepting this query, I have induced one of our glass dealers to introduce a style of jar with tinned iron cover, (a sample of which is now presented,) which answers a good purpose, although objectionable on account of the imperfect manner in which the mouth is finished. This jar, of the size presented, can be furnished to the trade at about seven or eight dollars per gross.

"What is the best plan for keeping ointments and cerates in the dispensing shop, so as to retard their tendency to oxidation?"

To make an ointment that will keep, it is of primary importance that the materials used should be of good quality, especially lard. This article is sometimes adulterated by an admixture of water, which answers the double purpose of rendering the lard white and increasing its weight. The amount of water introduced varies in proportion, according to the conscience of the operator. This variety of lard should be carefully avoided by the Pharmaceutist, as the ointments and cerates into which it enters undergo oxidation rapidly, and soon acquire a degree of rancidity which is offensive to persons in health, and of course much more so to the sick. What is called leaf lard, prepared at farm houses, and which is used by some Pharmaceutists, is undoubtedly the best for preparing ointments; but when this cannot be procured, the article known in commerce as pressed lard, answers a good purpose; being prepared from firm lard in the first instance, it is not liable to the objection of containing water.

Another advantage gained in the use of pressed lard for many ointments is, that the quantity of wax may be considerably reduced, which, on the score of economy, is of some importance; and as wax is used merely to give consistence to the ointment, it is a question whether an ointment prepared from pressed lard is not superior to one into which a large proportion of wax enters, on the ground of being more homogeneous.

The use of benzoin in the preparation of ointments and cerates undoubtedly tends to retard oxidation. It is best used in the form of tincture made in the proportion of four ounces to the pint of alcohol, two fluid drachms of which are sufficient for sixteen ounces of ointment.

Having volunteered the foregoing remarks in regard to the

preparation of ointments, it remains to answer the query as to the best plan of keeping them so as to retard the tendenc - to oxidation.

It is important that the dispensing jars for ointments should be of material impervious to fats. Jars of French or German porcelain answer this end, and ointments kept in them will resist oxidation for a much longer time than when kept in the ordinary Liverpool or earthenware, which is of a porous and absorbent nature. Whenever the least tendency to oxidation manifests itself, the jar should be thoroughly cleansed by means of strong soap and water, or a diluted solution of potassa or soda.

The position selected for the jars in the shop, should be one in which the extremes of ordinary temperature are avoided, such as a dark closet against a brick wall; near the floor and remote from the stove or heating arrangement. If the cellar is convenient of access, it is preferable for summer use.

By attending to the foregoing precautions, the Pharmaceutist will have little or no trouble with his ointments and cerates, and will never have to suffer the mortification of being reminded by a customer that he had dispensed a rancid preparation; such, at least, has been my experience in a practice of many years.

*Baltimore, June,* 1865.

*Proc. Am. Pharm. Assoc.*, 1865.

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## ON THE GROWTH AND PREPARATION OF RHUBARB IN CHINA.

By Fred. J. Farre, M. D. Cantab.

To the Editor of the Pharmaceutical Journal:

Sir,—It has often occurred to me that, while frequent attempts have been made, by personal inquiry and research, to discover the source and exact localities of the Chinese rhubarb plant, which have only resulted in deception and disappointment, we have in great measure neglected to avail ourselves of the more reliable information contained in Chinese books and manuscripts intended for the use and instruction of the Chinese themselves. An opportunity of obtaining such information was recently afforded me by Mr. Lockhart, who kindly supplied me with

some valuable Chinese books, from which I extracted the facts which I have recorded at page 269 of Pereira's "Manual of Materia Medica." This information respecting the various localities of the rhubarb plant was sufficiently interesting to induce me to make further inquiries through the same channel. Mr. Lockhart undertook to convey my wishes to China, and if possible to obtain either the leaf, flower, or fruit of the plant itself. He failed to obtain these, as, like others, he had often tried and failed before; but he procured from the Rev. Griffith John, a missionary residing at Hankow, the following extracts from the "Pun-tsau," or Chinese Herbal, which, as well as the "Pieh-luh," which it quotes, is a work of good authority. Wu-pu, Tau-hung-king, Kung, Su-sung, and Sung-ki are Chinese writers. I am indebted to Mr. John for the translation. The notes are added by Mr. Lockhart.

I give the extracts from the "Pun-tsau" exactly as I received them, that they may be available to others as well as myself; but to make them more intelligible I have subsequently rearranged and condensed them, and have finally drawn from them a few conclusions.

*Extract from the "Pun-tsau."*

1. In the "*Pieh-luh*" it is stated that rhubarb grows in valleys west of the Yellow River, and in the district of Lung-si, in the province of Shen-si. The root is extracted in the second and the eighth months, and dried by means of artificial heat.

2. *Wu-pu* says: As to the rhubarb which grows in Si-chwan (Sz-chuen), and probably Lung-si, in the second month* its closed leaves are of a deep yellowish color, and its stalk is more than 3 feet (Chinese†) high. In the third month the flower is yellow; in the fifth month the seed is black; and in the eighth month the root is extracted. The root, which contains a yellowish sap, is cut up in slices, and dried in the shade (*i. e.* without either sun or artificial heat.)

3. *Tau-hung-king* says that the Si-chwan rhubarb is not equal in quality to that of Lung-si in Shen-si; that it is very bitter in

* The Chinese months are lunar, the first beginning in February or March.—L.

† The Chinese foot is about 13 inches. It varies from 12½ to 14.—L.

taste, and extremely black in color; that that which is dried in the shade in the west of Si-chwan is superior to that which is dried in the sun in the north of the same province; and that that which is dried by means of artificial heat is slightly charred, and not equal to the rhubarb in the west of the province in resisting the woodworm.

4. *Kung* says that the leaf and stalk of the rhubarb resemble those of the Yang-ti plant. Its stalk, which grows to the height of 6 or 7 feet, is crisp and sour, and may be chewed raw. The leaf is coarse, long, and thick; the root is red, and resembles that of the Yang-ti plant; its shape is like a basin, and it is about 2 feet long; its nature is soft and moist, and it is easily destroyed by the woodworm. That which is dried by means of artificial heat is best. It is dried thus:—A stone is heated, and on it are placed the roots cut in horizontal slices about an inch thick. Being thus heated for a day, they become a little dry. A hole is then made in each piece, through which they are strung together like *cash*.* The root thus cut and partially dried is then hung up in the shade till it becomes perfectly dry and fit for market. The rhubarb which grows in Shen-si, Kan-suh, and in the west of Si-chwan, is all of good quality. That which grows in Shan-si, Chil-li, and other places to the north of these, is smaller in size, and not equal to that of Si-chwan in point of strength. What *Tau-hung-king* says about the Si-chwan rhubarb being inferior to that of Lung-si is a mistake.

5. *Su-sung* says, that rhubarb grows everywhere in Si-chwan, east of the Yellow river, and in Shen-si. The Si-chwan rhubarb is fine-grained. Next comes that of Shen-si. The plant of the latter produces green leaves in the first month, which resemble those of the Pima (*Ricinus Communis*, Linn.), and are as large as a fan. The root resembles a Chinese potato,† the largest being the size of a basin, and from one to two feet long. In the fourth month a yellow flower opens; in the second and eighth months the root is extracted, and the black skin which covers it

* *Cash* is a foreign name for Chinese copper coins, called *tung-tseen*, with a square hole in the centre.—L.

† The Chinese potato is the *Dioscorea Batatas*, or white Yam, a long cylindrical root which has been recently introduced into England.—L.

being taken off, it is cut in horizontal slices, and dried by means of artificial heat. The Si-chwan rhubarb is cut perpendicularly, which makes the slices resemble the tongue of an ox, and, hence it is called the ox-tongue rhubarb.* The uses and value of these two kinds of rhubarb is the same. Hwai-ngan-fu, in the province of Kiang-su, produces what is called Tu-ta-kwang, local rhubarb.† The flower opens in the second month.

*Sung-ki*, who prepared some diagrams illustrative of the productions of Yih-chau, in Si-chwan, says that the rhubarb plant grows everywhere among the high mountains of Si-chwan. Its stalk is red; the leaf is large; and the root is so large that it is used for a pillow in the medicine markets. He also states that the Lung-si rhubarb, in Shen-si, was considered best in his time. He lived in the Sung dynasty, between 1000 A. D. and 1270 A. D.

It seems that the Yang-ti plant has been mistaken by some for the rhubarb on account of its resemblance to it. Li-shi-chen affirms that it is quite a distinct species.

The foregoing account, as Mr. John observes in a letter to Mr. Lockhart, is far from satisfactory. The information is meagre and somewhat contradictory; nevertheless, it appears to me to add something to our former knowledge, and to throw a little light on the species, as it certainly does on the localities of the rhubarb plant. It is probably by collecting and comparing such information that we shall ultimately get at the truth. Avoiding repetitions, the above-mentioned statements may be arranged as follows:—

*Localities.*—The rhubarb plant grows in the provinces of Shan-si and Shen-si, which are situated respectively east and west of the Yellow river, in the upper part of its course, before it turns eastward towards the Yellow sea. Lung-si, in the province of Shen-si, is one of its best localities. It also grows in Chil-li and other places further north, in Kan-suh, which borders

* I believe what is intended is a thin diagonal slice, common in the shops, and which I used to buy. It might, by a lively imagination, be likened to an ox tongue. The others are transverse slices.—L.

† The best rhubarb is Sz-chuen. The others, and especially that of Khang-su, are called *local*, which implies inferiority.—L.

on Mongolia, north of the lake Koko-nor, and in the Nan-chan mountains, and everywhere among the high mountains of the province of Sz-chuen (or Si-chwan), which lies to the east of Thibet, and 3—400 miles north-east of the northern extremity of Birmah.

*Description of the Plant.*—The *root* resembles that of the Chinese potato, or white yam (*Dioscorea Batatas*). It is from one to two feet long, and thick enough to be used as a pillow. It is covered with a black skin, is soft and moist, and contains a yellowish sap. The plant puts forth its leaves in the first or second month. The unexpanded *leaves* of the Sz-chuen plant in the second month, are of a deep yellowish color; those of the Shen-si plant, in the first month, are green, as large as a fan, and resemble those of the Pima (*Ricinus communis*, Linn.) Kung describes the rhubarb leaf as coarse, long, and thick. In Sz-chuen, the *stem* is more than 3 feet high in the second month. According to Kung, who does not mention the locality, the stem attains the height of 6 or 7 feet, and is red, crisp, sour, and eatable in its raw state. In the third or fourth month it opens its yellow flowers, which are succeeded in the fifth month by a black seed (nut). The root, leaf and stalk of rhubarb, according to Kung, resemble those of the Yang-ti plant. This writer says that the root is red, but, in other respects, his description of it accords with that of the other writers.

*Preparation and Drying of the Root.*—The root is taken up in the second or eighth month, and the black skin which covers it is removed. It is then cut in slices, either longitudinally, as in Sz-chuen, or transversely, as in Shen-si and elsewhere, and dried in the shade with or without artificial heat. The following mode of drying is said to be the best:—a stone is heated, and the roots, cut in traverse slices about an inch thick, are placed upon it. By this means the pieces are partly dried. A hole is then made in each, and the pieces are strung on a cord, and suspended in the shade until they are perfectly dry and fit for the market.

*Quality.*—The rhubarb (*hwang*) which grows in Shen-si, Kan-suh, and in the west of Sz-chuen, is all of good quality. That which grows in Shan-si, Chil-li, and other places to the north of these, is smaller, and not equal in strength to that of Sz-chuen.

In Sz-chuen, however, the quality appears to vary, that which grows in the west and is dried in the shade being better than that which is dried in the sun in the north of the same province; while that which is dried by artificial heat is said to be slightly charred. Tau-hung-king, who makes the foregoing remark, adds that Sz-chuen rhubarb is not equal in quality to that of Lung-si in Shen-si; that it is black in color and very bitter. This, however, is altogether denied by Kung. Su-sung also says that Sz-chuen rhubarb is fine-grained, and next comes that of Shen-si. He adds, however, that the value of these two kinds is the same. Sung-ki, who lived between A. D. 1000 and 1270, says that in his time Lung-si (Shen-si) rhubarb was considered the best.

Notwithstanding the want of precision and agreement in the above statements, I think that, taken in connection with the extracts from "The Rules of the Drug Trade in China" and from "The Chinese Commercial Guide," they will warrant the following—

*Conclusions.*

1. Rhubarb grows in many parts of the Chinese empire, but chiefly in Kan-suh, south of Mongolia, about Ko-ko-nor, and on the Kawn-lun mountains, which forms the northern boundary of Thibet; and also in the provinces of Shen-si, Shan-si, Ho-nan, and Sz-cheun. From the former districts the dried root reaches Europe at present by way of Moscow; from the latter it is conveyed along the Yellow and Yang-tse rivers to the ports of Shanghai and Hankow.

2. The descriptions of the plant are not sufficiently precise to show whether the roots of only one, or of more than one species are collected for medicinal use. Any real differences in the descriptions are easily accounted for on the latter supposition. The contradictions, however, are more apparent than real. According to Kung the root is *red*, while Su-sung says that it is covered with a *black skin*, which is taken off. The black skin consists, as any one may see by examining the root of *Rheum palmatum* in the winter, of the black decayed bases of the sheathing petioles, which cover the rhizome, so that its red color is not apparent until these are removed. The difference in the height of the plant and the color of the leaves probably depends

on age or locality. The most important feature in the description is the statement of Su-sung, that the leaves of the Shen-si rhubarb plant resemble those of *Ricinus communis*, the only known species of *Rheum* whose leaves admit of this comparison being *R. palmatum*. Su-sung particularizes the leaves of the *Shen-si* rhubarb, as if this was different from the Sz-chuen plant. Possibly he was only acquainted with the Shen-si plant, and therefore spoke cautiously. There appears, however, to be another species of rhubarb, which Kung calls the Yang-ti plant. This is said to be often mistaken for the ordinary rhubarb plant, on account of its resemblance to it; but Li-shi-chen affirms that it is a distinct species. It is, probably, also a species of *Rheum*, whose root, though known in the market as Yang-ti rhubarb, is smaller and of inferior quality, and therefore not called rhubarb by first-class dealers. Yang-ti rhubarb means sheep's-feet rhubarb, and is so called from a fancied resemblance to the feet of the sheep, as the Sz-chuen rhubarb is called, doubtless also from its shape and size, hoof or horse-hoof rhubarb. The Tu-ta-kwang or local, *i. e.* inferior rhubarb mentioned by Su-sung, which flowers two months earlier than the palmate-leaved rhubarb of Shen-si, may be a third species. There are a few characters which do not correspond with *R. palmatum*, or indeed with any of our cultivated species. The resemblance of the root to a basin is far from obvious, and the so-called seed or nut is usually a rust-brown rather than black. The objection to *R. palmatum* being the source, or a source, of the officinal rhubarb has, I believe, been chiefly founded on the statement of Pallas, that these species appeared to be quite unknown to the Bucharians, and that their description corresponded most nearly with *R. compactum*, the seeds of which were sent to Miller from St. Petersburg as the true *Tartarian* rhubarb. But still less has hitherto been known of the rhubarb which grows in *China* itself; and I think I have now shown equally good reason for believing that the best kind of Chinese rhubarb—namely, the produce of Shen-si, and probably also of Sz-chuen—is *R. palmatum*, which, notwithstanding all that has been said against it, has always been considered to approach most nearly to Asiatic rhubarb. Kung, who does not mention any locality, but compares the

rhubarb to the Yang-ti plant, says that the stalk is crisp and sour and may be chewed raw. *Rheum palmatum* is not cultivated in England for culinary use; but Mr. Robinson, of the Botanic Gardens, Regent's Park, informs me that he has seen it so used in Ireland.—*Lond. Pharm. Jour.*, Jan. 1st., 1866.

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## ON THE FORMATION OF GLUCOSE BY LEAVES.

By M. Boussingault.

The supposition that the production of glucose and its congeners is principally effected by the aërial organs of plants is contradicted by the abundance of saccharine matter in the stalks, the roots, and especially by the formation of the same matter during germination, when the leaves are not yet formed. But the germination only transforms starch into glucose, sugar and cellulose; it brings no combustible element; on the contrary, the embryo, for its nourishment, consumes those pre-existent in the seed.

By looking at the vegetable world in its entirety, one is convinced that the leaf is the first resting-place of the glucosides, which, more or less modified, are found scattered in various parts of the organism; that it is the leaf which elaborates them, at the expense of the carbonic acid and water. In maize, wheat, &c., the accumulation of saccharine principles takes place in the stalk, up to the time of flowering, when all that has been formed assists in the formation of the seed. In beet root, this receptacle is the principal fleshy root. But where there is neither stalk nor root, where is the saccharine matter formed by the leaf deposited? In the leaf itself, which is then considerably extended. The most striking example is presented by the American agave, the maquey, the vine of the Mexicans, the culture of which extends from the time of Montezuma and further. The leaves of the agave all grow from the neck of the root; they attain two metres in length, twenty centimetres in breadth, and one decimetre at the point of attachment. During from fifteen to twenty years, these leaves elaborate and accumulate glucose, until the stalk which is to bear the flowers and fruits begins to form. Then the large, coriaceous, prickle-edged

leaves, after having remained so long inclined to the ground, raise themselves and approach the conical bud, as if to cover and protect it. Then there is a very apparent and gradual movement, seeming to obey a will. The bud lengthens with surprising rapidity, and a flower-stalk, five or six metres in length, is soon formed. The work of reproducing the seed is thus accomplished, and it is by preventing this, that the Indians procure an ample harvest of the sweet sap, by fermenting which, they prepare pulqué, their favorite intoxicating drink. One agave plant, in the environs of Cholula, yields in four or five months nearly one cubic metre of sweet liquid, after which it dies exhausted, as it would also die exhausted, were the stalk allowed to develop and bear flowers and fruit. An agave yields in four months about 100 kilogrammes of glucose, prepared and preserved by its leaves for years.*

There is no doubt as to the origin of this glucose; it proceeds from the carbonic acid and water decomposed by the leaves.

To conclude, I trust my experiments will enable me to dispute the direct formation of saccharine matter by the green parts of vegetables exposed to the sun.—*Lond. Chem. News*, Dec. 22, 1865, from *Comptes Rendus*, lxi., 664.

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## ON THE PHYSIOLOGICAL EXHAUSTION AND THE VITALITY OF BEER YEAST.

By M. A. Bechamp.

The life of the leaven being contained in the cellule, I supposed that, so long as this cellule was neither destroyed nor dead, the leaven would continue to live, and to manifest this life by its characteristic chemical actions, but in certain cases, such as those about to be described, like an animal in a state of inanition—that is to say, in exhausting itself.

To measure the physiological exhaustion of beer yeast, I estimated the phosphoric acid it eliminates while consuming its own tissues, when forced to live in distilled water.

Mitscherlich analyzed beer yeast, and from his analysis con-

† See Boussingault "Sur le Pulqué:" report made to the Imperial Commission for Mexico.

cluded that 100 grammes of dry yeast contained the elements of 4·28 gr. of anhydrous phosphoric acid. But this analysis does not prove that the acid was actually formed there.

The infusion of yeast is, no doubt, always acid, and this acidity may be attributed to phosphoric acid, if the yeast does not ceaselessly engender other acids. To ascertain that the yeast actually contained pre-formed phosphoric acid, and phosphates, boil the well-washed yeast in a large quantity of distilled water; this will kill it, and cause it to abandon various products, and among them phosphoric acid, which estimate by the process presently to be described, whence it will be found that 100 grammes of dry yeast disengages from 2·8 gr. to 3·1 gr. of phosphoric acid, of which a portion is free.

But though the yeast abandons large quantities of phosphoric acid, at a temperature of 100°, when it is killed, this is not the case when it is left in water, either cold or even heated to 30 or 40°; under these circumstances it abandons the phosphoric acid and other matters very gradually, not as an inert precipitate, but as a living creature, offering vital resistance to destruction. By renewing the water every twenty-four hours, and estimating the phosphoric acid in each lixivium, it will be found that the quantity of this acid, small at first, augments with each successive treatment, and rapidly attains a maximum, after which it decreases, until it altogether disappears. The following is the experiment:

In the first place I determined the amount of phosphoric acid which could be found in matters adhering to the yeast, proceeding from the medium in which the yeast was formed, or which had been excreted by the yeast itself and impregnated it externally. 500 grammes of brewers' yeast, new and in a paste, were soaked in cold water and washed on a filter. The yeast having been well drained, there remained four litres of lixivium. In this liquid the phosphoric acid was estimated by the same process which was applied to the following estimations; and there were obtained of anhydrous phosphoric acid, 0·095. gr.

This result is invariable; all things being equal, 500 grammes of yeast in a paste, representing about 100 grammes of dry

yeast, yield to cold water less than 1 decigramme of phosphoric acid.

280 grammes of this same washed yeast, containing 48·2 gr. of yeast dried at 100°, were introduced into a special apparatus with 1600 cubic centimetres of water boiled and then cooled to 40° in a current of carbonic acid. To make perfectly sure that no foreign bodies were formed, a few drops of creosote were added to the water intended for washing. Every twenty-four hours the water was decanted and renewed by a fresh supply, under the same conditions. All these washings were screened from the air in an atmosphere of carbonic acid, the apparatus being in a warm place, the temperature of which could vary from 20 to 30°.

These washings furnished the following results :—

| | gr. |
|---|---|
| 1st washing—anhydrous phosphoric acid. . | 0·056 |
| 2d " " " . . | 0·073 |
| 3d " " " . . | 0·074 |
| 4th " " " . . | 0·076 |
| 5th " " " . . | 0·346 |
| 6th " " " . . | 0·444 |
| 7th " " " . . | 0·371 |
| 8th " " " . . | 0·190 |
| Total of phosphoric acid . | 1·630 |

These numbers appear significant. Were beer yeast merely an inert precipitate, were phosphoric acid present in the mass, as mother liquor is in the precipitate, the washings would eliminate the greater part of the soluble matters in the first operations, and the quantity of these matters would diminish more and more. But we see here that the yeast at first resists, then suddenly its resistance diminishes, and it yields a large quantity of its disassimilated materials. This is ascertained by the weight of phosphoric acid eliminated, which suddenly increases to five or six times its previous weight; after which it naturally decreases. By adding the amount of the different estimations at 100° of the phosphoric acid in dry yeast, the number will be found to be 3·38. The weight of phosphoric acid eliminated is then greater by three-

fourths than that produced by the incineration of the yeast, as in Mitscherlich's process; and if it is observed that the yeast eliminates at the same time various other products, proportionately to the quantity of phosphoric acid, an idea may be formed of the degree of exhaustion undergone by each globule. The exhaustion is such that under the microscope the yeast seems reduced to merely its envelope; it is then barely visible, and its color so faint that it looks like shrivelled skins, with no clear outlines, and with a taste like raspberries. From the nuclei or interior granulations which remain, the form of the envelope may be divined.

If by the use of the apparatus, elsewhere to be described, the air is perfectly excluded, this exhaustion can be effected, without what is called the putrefaction of the yeast, or, more correctly, without the appearance of the organisms which cause the putrefaction of the organic matters eliminated. But if air enters, these products acquire a fœtid odor, and there may be observed a disengagement of sulphuretted hydrogen, and the formation of the infusoria, which are the cause of a particular fermentation of the nitrogenized and sulphuretted organic matters of yeast. However, if the other products accompanying phosphoric acid are different, the quantity of the latter in each washing corresponds to the numbers of the above table.

The yeast exhausted in the experiment which furnished the numbers given in the table appeared to be dead; but this was not the case, for it was still capable of transforming cane sugar into glucose—that is to say, of forming zymase and then producing alcohol by the glucose engendered. But the products of alcoholic fermentation by exhausted yeast are notably different in nature and in quantity from those obtained from normal yeast. The same as in alcoholic fermentation by mother of vinegar, a crystallizable compound is formed possessing the properties of mannite.

These results prove contrary to Mitscherlich, (who supposed that the globules of ferment, well washed in water are entirely deprived of the property of saccharifying cane sugar), that yeast continues to change cane sugar until it ceases to live, and that when it is so much exhausted that it may be said to be reduced

to its cellule, it nevertheless continues to form successively glucose and alcohol with cane sugar. The property of determining alcoholic fermentation must not, then, be attributed to the catalytic action of some chemical compound which it contains; my researches seem to prove that it is contained in the properties of the living cellule; it is a consequence of the act of nutrition of this cellule.*—*Lond. Chem. News*, Dec. 8, 1865, from *Comptes Rendus*, lxi., 689.

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## THE CALCUTTA BOTANICAL GARDENS.

Dr. Anderson's official report of the damages caused to the Calcutta Botanical Gardens by the cyclone of the fifth of October, 1864, has only just now been published, owing to the mass of detail it was necessary to collect. The document may be called a cry of despair. The gale was more violent at the garden than at Calcutta itself, owing to the place being nearer the centre of the cyclone, and more exposed to the full force of it. Few trees fell before 11 o'clock A. M., and none after 4.30 P. M., yet within this short space of time a paradise was converted into a wilderness. The great baobab-tree of Africa was uprooted, and came down with a crash that caused vibrations in the earth felt at a distance of some hundred yards. Three gigantic specimens of iron-wood, the oldest in the garden, none less than 150 feet high, were levelled to the ground. Many of the most picturesque parts of the garden, resulting from the grouping of trees, no longer exist. Of the whole fine teak avenue leading to Kyd's monument only two mutilated trees

* These conclusions are opposed to M. Liebig's assertion (*Traite de Chemie Organique*, introduction p. 27):—"The insoluble body called 'ferment' does not provoke fermentation." The proof he gives of this is, that the yeast washed with water, deprived of air, leaves a residue which has lost the power of fermenting cane sugar. This has caused it erroneously to be supposed that the phenomenon, being much less decided, had ceased to exist at all. On the other hand much less attention is given to the previous inversion of the cane sugar, and it is well known (notwithstanding an important and probably unknown experiment of M. Dubrunfant) that M. Pasteur has admitted that sugar cane ferments directly, the formation of changed cane sugar being consecutive to the formation of succinic acid.

remain. Of the splendid grove of mahogany-trees, some of which were planted in 1796, thirty-one specimens are blown down. The iron-wood avenue, planted by Dr. Wallich, has suffered severely. The water, breaking through the river embankment, and flooding the grounds, helped to complete the ruin. The scene presented the morning after the cyclone outdoes description. More than one thousand trees, and innumerable shrubs, lay prostrate. Nothing had been spared. Trees that had not fallen were more or less stripped of their branches. Not a vestige of a leaf, flower, or fruit remained; the lawn, roads and tanks were blocked up by trees and fallen branches, and hundreds of cart-loads of straw had been carried by the water into the grounds. More than seventy years will be required to restore the garden to the splendor in which it was on the night previous to the cyclone. The most singular part about this devastation is, that of the two great classes of plants into which the vegetable kingdom is divided, the endogens suffered the least injury. This produced a striking effect on the scenery. All the exogens being laid low, the country about Calcutta appeared to be covered with only four kinds of trees, the bamboo the cocoa-nut, the wild date, and the Palmyra.—*London Pharm. Jour., Jan. 1st*, 1866, from *Athenæum.*

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## ON CAMPHOR WATER.

By G. F. H. Markoe.

"Which process for Camphor Water is to be preferred, that of the U. S. Pharmacopœia or of the British Pharmacopœia?"

The United States Pharmacopœia directs Camphor Water to be made thus:

Rub 120 grains of Camphor with 40 minims of Alcohol, then with 240 grains of Carbonate of Magnesia, then with two pints of water gradually added, and lastly filter through paper.

Two pints of Camphor Water were carefully prepared in strict accordance with the above formula, and the magma of carbonate of magnesia and camphor remaining on the filter was transferred to a small beaker and treated with dilute sulphuric acid in very slight excess, by which means the magnesia was

dissolved as sulphate, and the camphor separated by the process was collected on a small filter, washed with camphor water to remove adhering sulphate of magnesia, then dried by pressure between folds of bibulous paper.

The camphor is now in the form of a dirty gray cake, being in fact very "crude". To purify it we dissolve it in a small portion of chloroform, and throw the solution into a small funnel, the neck of which is stopped with a bit of cotton, and finally the camphor obtained by the spontaneous evaporation of the chloroformic solution is carefully weighed, and the amount obtained deducted from the 120 grains of camphor used in the first instance.

Six experiments were made at various times with the following results:

1. 120 grs. camphor used, 55 grs. obtained from the magma.
2. 120 grs. " " 59 grs. " " "
3. 120 grs. " " 54 grs. " " "
4. 120 grs. " " 56 grs. " " "
5. 120 grs. " " 57 grs. " " "
6. 120 grs. " " 55 grs. " " "

The average amonnt by these experiments being fifty-six (56) grains, from the 120 grains used each time.

Deducting 56 grains from 120 grains gives us sixty-four (64) grains, which must be the amount of camphor held in solution by two pints of the Camphor Water of the U. S. Pharmacopœia, being in the proportion of two (2) grains to the fluidounce.

The British Pharmacopœia orders

Camphor broken in pieces, half an ounce, (avoirdupois) (219 grains troy, within a fraction.)

Distilled water one gallon (imperial measure.)

Enclose the camphor in a muslin bag, and attach this to the stopper of a jar containing the distilled water. Invert the jar, allow it to stand at least two days, and pour off the solution when required.

One imperial gallon of Camphor Water was made by the British process, and after standing three days the undissolved camphor dried carefully between folds of filtering paper and carefully weighed.

219 grains troy were used, of which (137) one hundred and thirty-seven grains remained undissolved, the difference, (82) eighty two grains, representing the amount of camphor in solution in one imperial gallon of the British preparation, or about half a grain to the fluidounce, or one grain of camphor to 936 grains or minims of water; being quite near the statement made by Berzelius, that one part of camphor is taken up by 1000 parts of water by rubbing them together.

The statement contained in the U. S. Dispensatory, given on the authority of Wm. Hodgson, Jr., that "our own officinal preparation, when properly made, contains about 50 grains to the pint, or more than 3 grains to the fluidounce," is incorrect; it only holds in solution thirty-two (32) grains of camphor in each pint, or two (2) grains in each fluidounce.

The United States Pharmacopœia Camphor Water contains two grains of Camphor to the fluidounce.

The British preparation contains about half ($\frac{1}{2}$) a grain of Camphor in each fluidounce.

The U. S. P. preparation is thus proved to be four times the strength of the British preparation.—*Proc. of the Amer. Pharm. Assoc.*, 1865.

*Boston, September*, 1865.

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## ESSENCE OF COGNAC AND OF WINE.

This is a mixture of several ethers of the ethylic series, but of which the special odor is that of pelargonic ether. The essences may be prepared in two ways: the first gives nearly pure pelargonic ether; the other, mixtures of very variable composition, and apparently inferior in quality. By the first method, pelargonic acid is obtained by treating oil of rue by nitric acid; to etherize pelargonic acid, dissolve it in concentrated alcohol, and pass into the mixture a current of dry hydrochloric acid; the pelargonic ether rises to the surface as it forms. By the second method, a fatty body is treated by nitric acid, and fixed fatty acids are produced, such as adipic, pimelic, lauric, succinic, &c., and also volatile acids, which may be distilled, and of which the chief are butyric, valerianic, capric,

caproïc, caprylic, œnanthylic, and pelargonic. This is the mixture which is to be etherized. Alcohol is sometimes scented with the product obtained by etherizing cocinic acid, extracted from cocoa-nut oil; to obtain this acid, saponify cocoa-nut oil by potash, decompose the soap by hydrochloric acid, dissolve the acid thus obtained in alcohol, and pass into it a current of dry hydrochloric acid; a yellowish liquid will be the result; wash it with water and with alkaline water, when pure cocinic ether will remain, which mix with ten times its volume of alcohol. The richness of commercial essences in pure essences may be ascertained by distillation; alcohol boils between 80° and 85°, and the essence remains as a residue. Artificial essences are not generally used in perfumery, excepting essence of mirbane; but other agreeably-scented essences will very probably be some day used, carefully combined and considerably diluted. As found in commerce, they have an odor which is far from agreeable, and they, moreover, have an injurious effect on the animal economy when inhaled in sufficient quantity; they must then, if used, be used sparingly.—*Chem. News. Dec.* 22, 1865, *Des Odeurs, des Parfums, et des Cosmetiques.*

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## ON THE MANUFACTURE OF CITRIC ACID.

By Frederick Row, F. C. S.

As so little attention has hitherto been given to the manufacture of these organic acids by scientific men (probably on account of the small quantity annually produced), a few observations from practical experience may not be uninteresting.

The first point of importance in this manufacture is the defecation of the lime or lemon-juice imported, and from which almost all the citric acid of commerce is produced.

This juice contains, besides the citric acid, a large quantity of coloring matter, mucilage, and other impurities, which in the ordinary method of working so contaminates the citrate of lime next produced as to render the subsequent solution, and also the crystals of citric acid, so impure that repeated re-crystallization and re-saturation are necessary to render them fit for the market.

Hitherto it seems to have baffled the efforts of manufacturers to overcome this difficulty, and hence the great cost at which the acid is prepared; but the writer of this paper has found that, when the concentrated juice is diluted to the same strength as the fresh juice (which contains about twelve ounces of citric acid to the gallon) a great part of the mucilaginous and other impurities will separate by subsidence in a flocculent form, and the citrate of lime and also the citric acid produced from the juice so purified will be in a state of comparative purity.

Another very important point for consideration of the manufacturer is the way in which the solutions of these acids are evaporated; the sulphuric acid, necessary to be in slight excess at first, so accumulates in percentage by the repeated evaporation and crystallization of the citric acid out of the solutions, as to cause a most destructive action upon that remaining in the mother liquors. Various means have been used to prevent this, the most successful being doubtless the substitution of water for steam heat during evaporation, but as the lower temperature requires longer exposure to heat, the advantage thus gained is almost counteracted.

The most effectual means of remedying this is by passing the mother liquors, so soon as they are found to contain any dangerous amount of sulphuric acid, through a fresh portion of citrate of lime, which not only removes at once all free sulphuric acid contained, but there is also deposited a quantity of flocculent matter which was held in solution by it, and which is no doubt the cause of the mother liquors when old crystallizing only with such difficulty. The flocculent precipitate referred to consists for the most part of sulphate of lime, but contains also some phosphate of iron and alumina, and accumulates more or less according to the care bestowed in evaporating the solution, it being most insoluble when the liquor contains about 6 lbs. of citric acid to the gallon, marking 1200 to 1250 (according to temperature) on the hydrometer, and if not separated from the solutions at that point it partly dissolves again as they become more concentrated.

As a consequence of this, it is found necessary, in the usual working, to re-saturate these solutions as soon as they become surcharged with these matters and the sulphuric acid above re-

ferred to, and thus renew the whole process continually, which of course necessarily increase greatly the expense of working, as well as loss both in time and material; but when the process of purifying referred to is adopted, it is found practicable to work continuously with the same liquors without saturating, (of course depending upon the amount of carefulness in the manipulation), and in such case the cost of production is lessened nearly one-half. The crystals of citric acid also being most tenacious of sulphate of lime will often hold it so as to render them contaminated even to the second or third crystallization, producing an opacity, which when dried gives them an appearance of efflorescence, materially affecting their commercial value.

This difficulty, which is also, in the opinion of the writer, to be overcome, will form part of a future paper.—*Lond. Chem. News.*

*Braintree*, Jan. 13, 1866.

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## A NEW ANÆSTHETIC.

Bichloride of carbon, the new anæsthetic, was first, I believe, discovered by M. Regnault, in 1839. It has already received various appellations from various chemists, as perchloroformene, perchlorinated chloride of methyl, bichloride of carbon, carbonic chloride, tetrachloride of carbon, superchloride of carbon, perchloruretted hydrochloric ether, and perchloruretted formene (see Gmelin's "Handbook of Chemistry," vol. vii, p. 355, and Watts' "Dictionary of Chemistry," vol i., p. 765).

If it becomes, as I believe it will, for some medicinal purposes, an article of the Materia Medica, it will require to have a pharmaceutical name appended to it, and perhaps the designation of Perchloroformene, or the shorter term Chlorocarbon, may prove sufficiently distinctive. In its chemical constitution, bichloride of carbon, or chlorocarbon, is analogous to chloroform; with this difference, that the single atom of hydrogen existing in chloroform is replaced in chlorocarbon by an atom of chlorine, for the relative chemical constitution of these two bodies may be stated as follows:—

Chloroform $= C_2HCl_3$
Chlorocarbon $= C_2Cl_4$.

The chlorocarbon can be made from chloroform by action of chlorine upon that liquid, and Geuther has shown that the process may be also reversed, and chloroform produced from chlorocarbon, by treating it in an appropriate vessel with zinc and dilute sulphuric acid, and thus exposing it to the action of nascent hydrogen. The most common way hitherto adopted of forming bichloride of carbon consists in passing the vapor of bisulphide or bisulphuret of carbon, together with chlorine, through a red hot tube, either made of porcelain or containing within it fragments of porcelain. There result from this process chloride of sulphur and bichloride of carbon, the latter being easily separated from the former by the action of potash.

The bichloride of carbon or chlorocarbon is a transparent, colorless fluid, having an ethereal and sweetish odor, not unlike chloroform. Its specific gravity is great, being as high as 1·56, chloroform is 1·49. It boils at 170° F., the boiling point of chloroform being 141°. The density of this vapor is 5·33, that of chloroform being 4·2.—*Lond. Chem. News*, Jan. 26, 1866.—*Extracted from a paper by Dr. Simpson.*

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## NEW PROCESS OF MAKING SODA.

Mr. A. G. Hunter, of Rockcliffe Hall, near Flint, has achieved a discovery which seems likely to lead to a most valuable modification in the process of making soda. It has long been known that caustic baryta will separate the sulphuric acid from a solution of sulphate of sodium, forming therewith an insoluble precipitate of sulphate of barium, and leaving caustic soda in solution. The decomposition of sulphate of sodium by caustic baryta is thus a far simpler and readier process than its decomposition by Leblanc's method; but caustic baryta has hitherto been, and is still, far too costly to permit of its use for the decomposition of sulphate of sodium on the great scale. Many attempts have been made to obtain it at a cheap rate from sulphate of barium, or "heavy spar," which is a sufficiently abundant natural product, but they have all been utter failures, and hence inventors have sought sedulously for some other and cheaper reagent, capable of acting, as regards sulphate of sodium, in the

same way. Mr. Hunter has found a very cheap one, indeed. He has discovered that lime, by far the cheapest of all alkaline bodies, will separate the sulphuric acid from sulphate of sodium in solution, provided that the solution, after the lime has been added to it, be subjected to a pressure considerably exceeding that of the atmosphere. He states that "either hydraulic, steam, or mechanical pressure," will answer equally well. Unless the application of the necessary pressure, on the large scale, should prove to be attended with greater difficulties than there seems any reason to anticipate, his discovery will revolutionize the soda manufacture; and by-and-by, all the carbonate of sodium produced will be obtained by the direct combination of caustic soda with carbonic acid, the caustic soda being obtained by a process embracing only two operations: (1) the decomposition of chloride of sodium, or common salt, by sulphuric acid, as in Leblanc's process; and (2) the decomposition of the resulting sulphate of sodium by lime.—*Am. Drug. Circ., Feb.*, 1866, from *Mechanics' Magazine.*

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## NEW PROCESSES FOR COVERING METALS WITH AN ADHERING AND BRILLIANT COATING OF OTHER METALS.

By M. Fred. Weil.

The author begins by observing that the galvano-plastic processes employed for depositing metals one on the other have the disadvantage of being expensive, and requiring apparatus expensive to keep in repair, and which, as is usually the case with cyanuretted baths, are unhealthy for the workmen.

The process proposed and employed by M. Weil, consists in the use of baths formed of metallic salts or oxides held in alkaline solution, (sodic or potassic,) and usually in presence of organic matters, such as tartaric acid, glycerin, albumen, or any other inoffensive substance which prevents the precipitation of the oxide by the fixed alkali. The deposit generally takes place at the ordinary temperature, but sometimes at a higher temperature. According to the author, his processes of the coppering and bronzing of iron, cast iron and steel, are of special importance; he can, moreover, vary at will the colors and tones, and

produce a series of results which it has hitherto been found impossible to produce, either directly or in a durable manner.

### COPPERING.

*Composition of the Coppering Solution.*—In ten litres of water dissolve,

| | |
|---|---|
| Crystallized sulphate of copper . . | 350 grammes. |
| Crystallized sodio-potassic tartrate . | 1·500 " |
| Soda lime containing from 50 to 60 per cent. of free soda . . . | 800 " |

This solution, which always gives very satisfactory results, contains nearly two equivalents of tartaric acid to one of oxide of copper.

*Action of Various Metals on this Solution.*—Iron, cast iron and steel, as well as the metals whose oxides are insoluble in potash and soda, undergo no change when introduced into these baths. For coppering, the zinc or lead is plunged into the bath, care being taken that the iron, cast iron or steel articles should not touch each other, but that one of them should be in contact with the zinc. The copper was thus deposited upon, and strongly adhered to the iron.

The coating of copper increased within certain limits with the duration of the immersion. The author feels bound to admit that galvanic action alone will not effect the coppering of iron, cast iron and steel, under the foregoing conditions.

In fact, the metals whose oxides are insoluble in potash or soda, and form only one basic oxide, become covered in the baths with but a pellicle of copper, the thickness of which does not increase with the length of time of immersion.

Pure tin introduced into the cold solution does not become coppered; by contact with zinc it oxidizes; the protoxide of tin there formed reduces the copper solution, and protoxide of red copper is precipitated. The liquid holds no copper in solution after an excess of tin has been for some time immersed in it.

*Process of coppering.*—The iron, cast iron, or steel articles are thoroughly cleansed by acidulated water;* they are then washed

* The water acidulated with sulphuric acid to 2° B. The action should be continued from five to twenty minutes.

in plain water, and finally in water made alkaline with soda; then cleaned with a scratchbrush, again washed, and plunged into the copper bath in contact with zinc.

The articles are suspended in the copper bath by means of zinc wire; they should be immersed from three to seventy-two hours, according to the color, quality and thickness of the copper coating to be deposited. A tap is then turned in the lower part of the apparatus, the cuprous liquor drawn off, and the coppered articles washed in water. They are then taken out, cleaned with a scratchbrush, and dried, first in sawdust, then in a stove.

It is much more economical to use zinc wire than zinc plates.

To keep the bath of one strength while operating on a large scale, the author, by the advice of M. Dumas, arranges his apparatus in a particular way, so that the liquid is renewed from below, and flows away drop by drop, or in a fine stream from the upper part, the level being kept constant.

*Renewal of an Exhausted Bath.*—After a great number of copperings the exhausted liquids are revived as follows:—

Precipitate the zinc in solution by sulphide of sodium, not in excess, and re-charge the solution with sulphate of copper. The constant saturation of the coppering bath may be effected by the following means:—

Introduce into the reservoir containing the cuprous liquid a cylinder furnished at the upper part with an india rubber valve, opening upwards. The liquid should contain hydrated oxide of copper, and the plug be controlled by a sort of ballcock floating in the liquid of the reservoir. In proportion to the diminution of the density of the liquid from the effects of the coppering, the floating ball descends, and by so doing opens the plug. The liquid enters the cylinder and dissolves the oxide of copper; it should be shaken, and when the bath is restored to its normal density the valve will re-close.

The raw materials, of a certain value, which enter into the solutions of copper—that is to say, caustic soda, sodio-potassic tartrate or glycerin, serve thus for an indefinite time.

The advantages attributed by the author to his process, when all the precautions indicated are attended to, are:

1. The perfect adherence of the copper deposited on iron, cast iron and steel.
2. The rapidity, simplicity and economy.
3. The faithful reproduction of the most delicate details.
4. The beauty of the colors.
5. The harmlessness and stability of the solution.
6. The power of repairing articles coppered or covered with any other metal by the author's processes.*

*Ordinary Bronzes.*—Yellow bronzes bronze in beautiful tints in copper baths without contact with zinc.

The alloy which has been found to furnish the most beautiful tints by the action of cuprous baths was formed of,

| | |
|---|---|
| Copper . . . . . | 83 |
| Zinc . . . . . | 14 |
| Lead . . . . . | 0·6 |
| Tin . . . . . | 1·3 |
| Nickel . . . . . | 1·1 |

*Bronzing of Red Copper.*—The bronzing of red copper, even when galvanic, is effected by contact with zinc, by varying the nature of the salt of copper and the proportions of alkali and of sodio-potassic tartrate.

*Zincing.*—Copper or coppered metals may be covered with zinc by immersion in a concentrated solution of potash or of soda heated to 100° in presence of metallic zinc.

The coating of zinc deposited is fixed and brilliant.

The author considers the metal thus deposited to be less attackable by acid liquids than ordinary zinc.

*Tinning and Leading.*—Copper and coppered metals, as well as cast iron, iron and steel, may be tinned and leaded in contact with zinc, by means of a salt of tin or lead dissolved in a strong solution of potash or caustic soda at 50 or 100° Centigr.

A deposit of pure tin or lead is not obtained in this way, for it contains zinc. To produce a deposit of pure metal of increasing thickness, place in the vessel containing the solution of tin

* For this purpose clean the damaged part with an alkaline lixivium, surround the part with an elastic cup containing the solution, and touch the object with a zinc wire; a fresh deposit is then formed on the metal.

a porous vase holding the alkaline lixivium and the metallic zinc. Plunge the article to be tinned into the outer vessel, and establish communication between the article and the zinc by means of a conducting wire. To revive the lixivium after it has become saturated with oxide of zinc, precipitate by sulphide of sodium.

*True Bronzing.*—Iron, cast iron, steel and other metals may be covered with a coating of alloy of copper and tin (true bronze) by an operation effected without the aid of heat.

This result is produced by adding to the copper bath some stannate of soda, or a solution of bichloride of tin, previously treated with a sufficient quantity of soda; immersing the article in contact with zinc determines the deposition of bronze.

*Alkaline Baths Containing other Metals Instead of Copper.*—Tartro-alkaline baths containing, for instance, cobalt or nickel, instead of copper, form no adhering metallic deposit in presence of zinc; they disengage hydrogen. Copper, or metals previously coppered, if heated, become covered with a white metallic deposit, consisting of an alloy of zinc and cobalt, zinc and nickel, &c.—*Lond. Chem. News, Jan.* 5, 1866, from *Annales de Chemie et de Physique,* iv., 374.

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## METHOD OF HASTENING FILTRATIONS.

To the Editor of the *Chemical News.*

*Sir,*—In your number 306 (vol. xii., p. 180) you mention Dr. Picard's "Way of Hastening Filtrations" as rather an injurious* one, and, therefore, few of your readers will have felt inclined to consult the description given in the original paper. I happened to come across the latter, and found that the author himself does not attribute much value to the method you described with a few words, on account of the complication of apparatus, and of the danger of breaking the filter. But he proceeds to propose another arrangement, which obviates both these drawbacks; and since I have found on trial every one of his statements to be correct, I venture to

* The word *injurious*, we must state, was a misprint for ingenious.—Ed. C. N.

draw your attention to it once more, and to subjoin a sketch of the arrangements proposed by him, selecting the obviously best modification.

The funnel is elongated, by means of an elastic joint, into a long glass tube, having a kind of loop in its upper part, which serves to keep a constant column of liquid in the tube, and causes it to act as an aspirator.

Having used this contrivance constantly for many weeks, I can but fully confirm Dr. Picard's final statements, of which, therefore, I beg to subjoin a translation:

1. The column of water not exceeding one foot in length, there is never any danger of a filter breaking.

2. The funnels should not have a bulge, but they should be exactly conical, so that the paper filter lies everywhere close on the glass, without any creases or other irregularities; it must then be wetted, and all air-bubbles between the glass and paper must be pressed out with the finger. This preparation is indispensable.

3. If the last-mentioned condition is fulfilled, the rate of filtration is ten or twelve times quicker than without the bent tube. If that condition is not completely fulfilled, but if some air is sucked between glass and paper, so that a row of beads is generated in the aspirating tube, instead of a continuous column of liquor, then the rate sinks to four or five times the ordinary one; but even with filters badly made on purpose it only comes down to three times.

I may be allowed to add that hot liquids are found to work far better than cold ones, in spite of the counter pressure of their vapors, and that in no instance have I noticed any increase in the tendency of some precipitates to pass through the filter,—a disadvantage which can easily be avoided by using the denser Swedish filtering paper, since in the new arrangement the latter is no more objectionable on account of the slowness of its working.

I am, &c. GEO. LUNGE, Ph. D.

South Shields, January, 3. 1866.

—*Chem. News, Jan.* 12, 1866.

## MANNITE FROM THE OLIVE TREE.

Professor De Luca, of the Royal University of Naples, exhibited at the Dublin Exhibition a series of mannites, which were very interesting, as they were produced from a new source, viz., the olive tree. This sugar seems intimately connected with the formation of the oil or fatty matter.

Mannite, the sugar of manna, mushrooms, and many plants, is a substance that bears a closer analogy to glycerin than even to sugar. Like glycerin, it forms a nitro-compound (nitro-mannite), which explodes very violently when struck. It is pre pared by treating mannite with the strongest nitric and sulphuric acid. It forms beautiful fine white acicular crystals, insoluble in water, but soluble in alcohol and ether. If carefully heated, it may be decomposed without explosion; but when it is suddenly heated, it explodes, but not with great violence. It has been proposed to use nitro-mannite for charging percussion caps.*

Professor De Luca has shown that mannite exists in different proportions in every part of the olive tree. He sent specimens from the green leaves, from the leaves commencing to turn yellow, from the flowers, unripe olive, and the olive commencing to ripen. This saccharine principle is not always found in the same quantity at all stages of vegetation. At the period o blossoming it accumulates in the flowers and diminishes in the leaves. The fallen flowers, having once completed the phenomenon of fecundation, no longer contain any mannite; it has likewise been found impossible to obtain the slightest traces of it in the yellow fallen leaves. Mannite exists in the fruit as long as it continues green—diminishing in proportion as it ripens—and disappears entirely when it becomes perfectly ripe, and contains the greatest quantity of oil. In a private communication, not at present published, Prof. De Luca says that these investigations were commenced in the year 1858. Experiments are still going on to determine at what period of vegetation the fatty matter was formed in the olives, and what is, or what are, the

* Nitro-glycerin is used for blasting rocks, and is at the present time being successfully used in making the heavy cuttings for the new Dublin Waterworks. Nitro-mannite, if it could be made available, has the advantage of being a solid, whilst the nitro-glycerin is a fluid.

materials which have given it birth. The olives at the commencement of their formation contain a green, and traces of a fatty matter; but proportionally, as the fruit of the olive develops itself and increases, the fatty matter develops itself and increases also.

The chlorophyll (green-coloring matter) which was found in abundance in the leaves and fruits of the olive tree, always accompanies the mannite. The saccharine matter exists in small quantities when the leaves begin to develop themselves; it augments with their progression; diminishes during the flowering of the plant and when the leaves begin to lose their green tint. It disappears entirely when the leaves are yellow and fall spontaneously from the plant.

The leaves of the olive tree are perpetual; that is to say, they do not become detached from the plant until the new green leaves become formed and developed. When the fruits are perfectly ripe, and have lost their green tint, they contain no mannite. When the mannite is exhausted the oil is at its maximum. The decrease of the saccharine and green matter in the olives during the increase of the fatty matter, and the disappearance of those same substances when the olives contain a maximum of oil, show that there must exist some relation between all these matters; and that if the chlorophyll and mannite are assimilated, it is that they give foundation to some other substances, amongst which must figure the olive oil.—*Am. Drug. Circ., Feb.*, 1866, from *London Chemist and Druggist.*

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# Varieties.

*The works of Lavoisier.*—Chemists who have read the "Chemical philosophy" of Prof. Dumas, know the earnest words with which that chemist, in 1836, entered upon the task of getting out a complete edition of the works of Lavoisier. Our readers are aware from our former communications (this Jour., xxxii. 98, xxxv. 262) that this engagement is on the point of being fulfilled, that the edition is in the press, and that three volumes have already been published at the expense of the State.

Many events have prevented the prompt publication of this important

work, although, in 1843, Dumas, then President of the Academy of Science, obtained from the Minister of Public Instruction permission that the publication should be made at the expense of the department. It was not till 1861 that his plan began to be executed; three volumes have appeared; the fourth is in the press; this will be followed by two others, treating of questions on administration, agriculture, political economy, &c.

Lavoisier was a complete man. He was not only remarkable as a chemist and physicist; he was an administrator of no ordinary merit. This is evident in the papers which he has left, and which will appear with the series of unpublished documents that Dumas has collected in part from the family of Lavoisier, and in part from notes made by this unfortunate savant during his journeys, which, as well as his laboratory notes and other papers, were happily preserved, they having been long in the hands of Arago, to whom they were confided by the daughter of Lavoisier.—*Correspondence of Prof. Nicklés, in Silliman's Journal.*

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*Magnesium Light.*—The remarkable properties of magnesium light are now familiar to all. (See this Jour., xl. 287.) Some facts have been recently observed that are not yet generally known. As regards its chemical effects, this light is well fitted to render luminous phosphorescent bodies, as was fully ascertained by Mr. Chautard in the month of January, 1865. This is now a lecture-room experiment. Take a series of wide tubes enclosed in a box and filled with phosphorescent substances. All these tubes are white; but when struck by the magnesium light each becomes phosphorescent, taking its own special color. About a year since, also, Mr. Lallemand discovered that a mixture of chlorine and hydrogen will explode under the influence of magnesium light; and, moreover, that this explosion does not take place in darkness, nor under the influence of the red or yellow rays, as had already been remarked for common light by Gay Lussac and Thenard.

Magnesium ignites even in the vapor of water, when it is brought in contact with it in a tube containing magnesium heated over an alcohol lamp; the metal burns with brilliancy, disengaging the hydrogen. Under the same circumstances zinc will not burn except at a much higher temperature. This observation has just been made by Messrs. Deville and Caron; these chemists satisfied themselves that magnesium, when cold, decomposes water in the presence of the feeblest acids, even of carbonic acid.

If this metal were not so expensive its light could be applied to numerous uses. A recent invention of an Italian, Mr. Carlevaris, may perhaps prove to be a successful application of it. In place of the metal, he takes the chloride of magnesium, which he exposes to a jet of ordinary illuminating gas and atmospheric air with a tenth part of oxygen. The light thus produced is very brilliant and appears to answer admirably for the production of photographic images, or for magnifying them.

At first Mr. Carlevaris used magnesia, and also carbonate of magnesia. But he found afterwards that the chloride gave better results.—*Correspondence of Prof. Nicklés, in Silliman's Journal.*

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*Acclimatization of the Ostrich.*—In my letter of April, 1861, I have spoken of the attempts to acclimatize the Ostrich. The Society of Acclimatization continues to watch and encourage these efforts. They now begin to hope that even in temperate climates, the Ostrich may figure among the useful animals. The following are the facts upon which these hopes are founded. We have already seen that these animals can reproduce in captivity, but as yet only in the warm regions of Europe, at Florence, Marseilles, Madrid, or in Algiers. This year, however, a birth of ostriches has taken place in the cooler region of Grenoble, in the garden of acclimatization of the Regional Society of the Alps.

The ostriches at the time of breeding were kept in a chamber. After 46 days two young ones appeared, to which the female seemed as devoted as she had been indifferent to the eggs. On this occasion, as has been before observed, the little ones placed themselves only under the male, and received no nourishment from the parents.

After the results obtained in Spain, and since in England, we may hope also to acclimatize the Cassowary.—*Correspondence of Prof. Nicklés, in Silliman's Journal.*

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*On the Hydraulicity of Magnesia.*—M. H. St. Claire Deville read a note before the Academy of Sciences, December 4, 1865, of considerable industrial importance. He said that seven years ago M. Donny sent him a specimen of magnesia prepared by the calcination of the chloride. Some of this, which was in compact anhydrous lumps, he left for several months under a tap in his laboratory, constantly exposed to running water. In this time it took a remarkable consistence, became hard enough to scratch marble, and as translucid as alabaster. After six years' exposure to the air it has in nowise changed, and its analysis gave the following results:—

| | |
|---|---|
| Water | 27·7 |
| Carbonic acid | 8·3 |
| Alumina and oxide of iron | 1·3 |
| Magnesia | 57·1 |
| Sand | 5.6 |
| | 100·0 |

Thus the substance appears to be essentially a crystallized hydrate of magnesia, like brucite, which does not absorb carbonic acid. To prove that it really was so, M. Deville prepared magnesia by calcining the nitrate, powdered it, made it into a semi-plastic mass, and sealed it in a tube with some boiled distilled water. After some weeks the mass became as hard and compact as the other, and also crystalline and translucid. After dry-

ing in the air this mass was found to have the composition HO30·7,MgO 69·3, showing it to be a simple hydrate of magnesia. With similar magnesia the author took casts of medals, as with plaster of Paris, and on placing the casts in water found them to assume the appearance of marble. M. Balard's magnesia—that is, the magnesia prepared by calcining the chloride obtained by the treatment of sea-water,—calcined at a red-heat shows astonishing hydraulic qualities. Calcined at a white-heat for hours its hydraulic qualities are in part destroyed. A mixture of chalk or marble and magnesia forms with water a plastic mass, which after remaining some time in water becomes extremely hard. With a mixture of equal parts of this magnesia and powdered marble, the author hopes to make busts which by hydration will be converted into artificial marble. A mixture of plaster of Paris and magnesia he finds to break up under water. The next experiments are of great importance. The author finds that a dolomite rich in magnesia when calcined below a dull red-heat and powdered and made into a paste, forms under water a stone of extraordinary hardness. M. Deville exhibited to the Academy specimens he had made with the dolomite used by Messrs. Bell, of Newcastle, for making Epsom salts by Mr. Pattinson's process. When the dolomite is strongly ignited and some quick-lime produced, the mass does not set so well, crystals of arragonite separating in thin veins. When dolomite is heated to bright redness, and all the chalk converted into quick-lime, the paste formed with it breaks up in water. All the experiments, M. Deville states, show that the magnesia is the binding material, which in becoming hydrated holds together the particles of chalk or marble to form a compact homogeneous stone. He has exposed some of the stones to the action of the sea in the port of Boulogne, and they at present remain unaltered. The facts contained in this note proved the perfect hydraulicity of pure magnesia by the formation of a definite hydrate.

The experiments with dolomite are of the most importance to us, and no doubt some of our readers will follow up the experiments made by the accomplished author of this note.—*London Chem. News, Dec.* 15, 1865.

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*Chloroform for Removing Stains of Dry Paint.* By Thomas B. Groves, F.C.S.—An accident, involving the loss of several ounces of chloroform at a time when in consequence of a sudden and unprecedented demand, it was peculiarly valuable, introduced me to the knowledge of a fact I was previously unaware of, viz., that chloroform is capable of exerting a powerful solvent action on dry white-lead paint.

The accident happened in this way. The four ounce measure I was using had been broken, and afterwards carefully mended with white lead, several months being allowed for it to become thoroughly hard. In that state it was, as I imagined, capable of resisting for at least a short time, the action of any of the more powerful solvents to be found in a chemist's shop. On pouring chloroform into it, however, I was at once undeceived,

for the bottom fell out immediately, without sufficient warning to enable me to save one drop of the liquid. Had it been mended with barley sugar, and water then poured into it, the effect would not have been more sudden.

To turn this loss to some account I then tried comparatively the respective effects on old paintwork, of Ether, Benzol, Bisulphide of Carbon, and Chloroform. I found that the last, applied on wadding with gentle friction, speedily exposed the clean surface of the wood, whilst the Ether and Benzol removed the more recent only of the layers of paint. Bisulphide of Carbon apparently was without action.

Query, then, would it not be advisable in cases where valuable dresses have been to all appearance spoilt, by paint being allowed to dry upon them, to try the effect of chloroform before giving up all hope? At any rate I shall try it on the first case I meet with. I have already discounted the smiles of the fair ones, whose gratitude I intend to deserve.—*Weymouth.—Chemist and Druggist, January* 15, 1866.

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*Cheap Manufacture of Phosphate of Soda, and its use in Manure.*—We read in *Les Mondes* a statement by M. Dumas that coprolites are now made into phosphide of iron containing from 14 to 15 (?) per cent. of phosphorus. This is done by heating the coprolites with iron ores in a reverberatory furnace. The phosphides so obtained are sent to Paris and treated with sulphate of soda, by which sulphide of iron and phosphate of soda are formed. The phosphate of soda and some magnesium salts are mixed with the contents of cesspools, whereby an ammoniaco-magnesian phosphate is produced, and all the ammonia and phosphates in the urine and fœcal matters are fixed. This plan of treatment is the invention of M. Boblique.—*London Chem. News, Jan.* 5, 1866.

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*Process for Rendering Wood Plastic.*—A very simple method of rendering wood plastic has recently been discovered. It consists in injecting diluted hydrochloric acid into the wood under a pressure of about two atmospheres. The duration of the operation must be regulated by the nature of the wood, the bark is not removed, and by a very simple arrangement the liquid injected at one extremity may be partially collected at the other. If the green wood is submitted to pressure, the cellules having been previously washed with water, it may be reduced to a tenth of its original size; the fibres may be excessively compressed without breaking or tearing, and when dry have no tendency to resume their natural condition. Woods treated in this way will serve for many purposes. If after the treatment with hydrochloric acid the wood is washed and dried, it may be cut and chiselled with great facility, and serves admirably for sculptural purposes. The wood is dried by passing air under pressure through the cellules at about 37°, the moisture is rapidly expelled, and as the mass contracts evenly throughout, there are no cracks. Colors or the various substances which prevent wood from rotting may be injected in a similar manner;

soluble glass or freshly precipitated silica renders it very durable and at the same time incombustible.—*London Chem. News, Dec.* 29, 1865, *from Wochenschr. des Nied. R. Oest. Gew.-Vereins*, 1865, p. 502.

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*Dentists' Hard Rubber.*—A paper on Hard Rubber, by Dr. Wildman, was presented and read by Dr. Buckingham, before the *American Dental Association*, giving the results of some of his experiments, analytical and synthetical. Finding the manufacturers of the rubber compounds for dental purposes extremely reticent as to its composition, and but little more knowledge to be gained from the specifications of the patents, the Doctor instituted a series of experiments, to obtain a better knowledge of the value of the different compounds vended for the use of dentists. A number of experiments are detailed to test the amount of earthy matter in different rubbers found in the market; of these, the American Hard Rubber Company's left five and four per cent. respectively of ash, one of the doctor's make three per cent., while the English rubbers and others of home manufacture left a residuum of from forty to sixty per cent. when brought to a white heat. Proceeding with the process of manufacturing different samples, we learn that, in making rubber compounds, the caoutchouc may be mixed with sulphur and the coloring matter, by being passed repeatedly between steam-heated rollers, or, for experimental purposes, the caoutchouc may be first reduced to a pulpy state by some one of its solvents, and the sulphur and other substances—being previously ground very fine—thoroughly incorporated with it. The solvents used are naphtha, benzine, or oil of turpentine, which are afterwards evaporated by exposure of the mixture to the air on plates of glass. Several different compounds, of various colors, are described in their composition. Caoutchouc being the cement which binds all the materials together, a glance at the accompanying table will show the great inferiority of the English pink to either the brown or red rubber for dental purposes. When the composition contains but a small proportion of this cement, its weakness of texture would render it liable to produce injurious effects by its susceptibility to abrasion in the mouth. The following table gives very nearly the percentage of caoutchouc contained in the doctor's formulæ, and also that of the English pink rubber:

| | Caoutchouc. | Sulph. | Verm. | Sul. Cad. | Ox. Zinc. | Parts in |
|---|---|---|---|---|---|---|
| Brown | 66⅔ | 33⅓ | — | — | — | 100 |
| Red | 44 | 22 | 30·0 | — | — | 99 |
| Yellow | 44 | 22 | — | 33·0 | — | 99 |
| Pink | 42⅔ | 21⅓ | 9·0 | — | 27 | 100 |
| Buff | 35·4 | 17·7x | 7·3 | 4·4 | 35·4x | 100 |
| Drab | 44 | 22 | — | — | 33 | 99 |
| Light | 28·5x | 14·3x | — | — | 57·1x black. | 100 |
| Black | 50 | 25 | — | — | 25 | 100 |
| Yellow | 40 | 20 | — | — | 40 | 100 |
| | | | | white earthy matter. | | |
| English pink | 24 | 52 | 12 | — | 48 | 102 |

—*Dental Cosmos.*

# Editorial Department.

THE NEW PROFESSORSHIPS IN THE UNIVERSITY OF PENNSYLVANIA.—With the month of April this new School of Science will commence its work. Of the sciences to be taught, those of Botany, Mineralogy, and Zoology interest the Pharmaceutical student. The Botanical course, by Prof. R. C. Wood, is particularly worthy of the attention of apothecaries and students of Pharmacy, and we are informed that, with the view of encouraging the attendance of apothecaries, students of the Philadelphia College of Pharmacy are admitted without charge for matriculation, and at the reduced price of $7.50 per ticket. The botanical lectures are between 4 and 5 o'clock, P. M., and we earnestly invite attention to them.

ALUMNI ASSOCIATION OF THE PHILADELPHIA COLLEGE OF PHARMACY.—"*Dear Sir*: You are respectfully invited to attend the Annual Meeting of the Association; the preliminary session to be held on Friday afternoon, March 16th, 1866, at 3½ o'clock, and the general session on Saturday afternoon, March 17th, at the same hour, in the Hall of the College. If unable to attend, any communication you may have to present should be addressed to the undersigned.

"Very respectfully,

WM. C. BAKES, 800 Arch St., Philada."

We are reminded by this notice of the great object kept in view by the Alumni Association, viz., the creation of a fund to sustain a practical school of chemistry and pharmacy, under the auspices of the Philadelphia College of Pharmacy; and the question has repeatedly forced itself on our attention,—"In what way can the intentions of the donors be most effectively carried out with the means to be provided, so as to prove most useful to the students who may attend it, and most creditable to the College whose reputation it will involve?" We have asked this question of some of the gentlemen most prominently engaged in the movement, but have found that their attention seemed directed primarily to the creation of the fund, believing that the Board of Trustees of the College will be able to shape and create the schools when the proper time arrives. With due deference to those holding this opinion, we believe it to be but just to those who are asked to contribute to the fund, to present a well digested scheme or programme of the Constitution of the school proposed to be founded, including even some of the details of the cost of material and apparatus required to start it for a limited number of students, the time that would be devoted

to practice daily, and an outline of the manner of giving instruction in each of the two branches to be taught. Some such outline of the main features of the tuition to be given should be prescribed by the Constitution of the School, leaving the lesser details to the Professors who may be appointed o carry them out.

The question will then come up, whether this instruction is intended to *perfect* students who may be in shops unfavorable for gaining a practical experience, or whether it is to be a substitute for the shop? We hope not the latter. While the curriculum should involve an examination in the rudiments of Pharmacy, and where these have been but imperfectly attained it should insist on their acquirement, yet the main and true object of the School should be to give perfect lessons in pharmaceutical manipulation with the best forms of apparatus, and to afford the student full opportunities to become skilful in their uses and applications, especially of those which the tendency of latter years has nearly banished from the shop. For instance, the important processes of solution, evaporation, and distillation, and their use in making tinctures, syrups, fluid extracts and extracts, distilled waters and oils, and which should involve a large portion of the attention of the apothecary in his laboratory and shop, when not engaged in dispensing. Then will come furnace operations, the purification and crystallization of salts, the preparation of cerates, ointments, and plasters. When these laboratory operations have been practically studied, the course should include exercises in all those numerous details involved in dispensing, and called extemporaneous pharmacy,—as pill making, plaster spreading, the preparation of suppositories, emulsions, mixtures, capsules and granules, pill coating, etc. The exercises in these might begin before the laboratory course was completed, as an alternative on a certain day or days of the weekly programme, so as to carry on both together. The course might appropriately terminate with a well arranged exercise in dispensing prescriptions, which should be chosen to include some of the most difficult and perplexing examples of this responsible engagement, which occur in the daily routine of a well established shop.

The course on Practical Chemistry will be the most elaborate and the most expensive, both as regards time and material. It naturally divides itself into two parts: Preparative Chemistry and Analysis. It is to be presumed that every student who enters on this course will have had some knowledge of the elements of Chemistry, either by home study of books, or from lectures, for, whilst each student would have his own practical orbit to revolve in, and in which he would have the personal instruction of his teacher, yet, without preliminary preparation, it would be difficult to carry on a class so that such beginners could avail themselves of the general remarks of the Professors on those occasions set apart for comment on processes involving important principles of chemical philosophy.

It is true that the lectures of the College, progressing at the same time would meet this difficulty in regard to beginners at the winter course, ye

the order of the subjects, as taught practically and theoretically, would prevent them from being carried on *pari passu*; and, besides, the Spring course would not be attended by lectures. Nevertheless, the lectures on General Chemistry in the College would prove a most powerful auxiliary to the practical school, especially if they should both be under the direction of the same Professor, and if carried on in such a relation to each other as to shed mutual light; the one yielding products to illustrate theory, the other principles to explain practice. We presume the first part of this course would be to familiarize the student with apparatus and manipulations of a rudimentary character, as in the pharmaceutical course, to fit him for commencing the preliminary study of chemical bodies, to attain a certain degree of familiarity with which seems to be requisite before entering regularly on their thorough examination. It is hardly necessary to say that the latter should be gone through before entering upon analysis,—at least before commencing a course involving the qualitative and quantitative analysis of inorganic and organic bodies.

If this proposed branch of our College operations should be established and consolidated by a few years' experience, we have no doubt that it will prove a most valuable source of practical knowledge to a numerous class who, otherwise, will continue badly fitted for their pharmaceutical duties. Further, the analytical school, would add greatly to the reputation of the College, and as it would be the duty as well as interest of the Board to keep the standard high for truthful accuracy, this reputation would bring to the School much outside patronage for commercial, medicolegal, or mining analysis, which would add to the income of the teacher.

The class of persons who it is anticipated would avail themselves of this School, include, 1st, regular College students, who can have the time; 2d, young pharmaceutists in distant places, where they cannot learn the practical parts of their business thoroughly, and who, in a single course of five months, could obtain what they need; 3d, amateur students of Chemistry, who wish to take the practical and analytical course to become thoroughly familiar with laboratory manipulation.

It may be asked, "would apothecaries' apprentices take the course on practical Pharmacy?" That will depend upon whether their positions afford them opportunity to learn the proper details of their business, and their disposition to become thorough apothecaries. (It will also be influenced by the dispositions of their employers, and their pecuniary ability.) But few of such would need the rudimentary part of the course, yet even this would not *hurt* very many who believe themselves experts. That part of the course on preparative (or manufacturing) pharmacy,—*a branch of the business now much neglected by a large number of drug-store keepers*,—would be most sought, and it is this feature of the proposed School, as a set-off to the hurtful effects on the rising generation of pharmaceutists of the wholesale manufacturing of pharmaceutical preparations, which should give to this scheme a liberal encouragement.

Having said this much, it will not do to pass unnoticed the great preliminary work of raising the fund of ten thousand dollars, which the Alumni Association have so zealously taken in hand. Among the graduates since 1827,—nearly forty years,—many have been successful in business, and many others in a fair way to be so. From this source the Association expect mainly to succeed, presuming that as graduates of the College they will naturally feel a disposition to do it a good turn. But we trust in an educational enterprise so excellent in its tendencies, and capable of producing fruits so rich in advantages to the pharmaceutical and medical professions, our wholesale druggists and manufacturing chemists will extend a liberal contribution to aid the efforts of the Alumni.

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The Cavendish Society.—For the information of such former subscribers to the Cavendish Society as have discontinued their subscriptions, owing to the high price and irregular issue of the publications, we will state that the Society at present issue but a single volume for each year's subscription, and that the only work in progress is Gmelin's hand-book, of which the 16th volume was published in 1864, on the subscription for 1862. The Editor of this Journal, in the capacity of agent of the Society, notified the subscribers of the publication of the 16th volume last year; but a few responded to the call, and these have been duly supplied with the volume. The invoice then received having been exhausted, it is suggested to all those who are disposed to continue their subscriptions, to forward the amount (*five dollars in gold, or its equivalent in currency,*) to the Agent as early as possible, as hereafter the volumes must be paid for in advance of importation.

It is the opinion of Dr. Watt, the Editor of Gmelin's hand-book, that the next, or 17th volume, will conclude the text, and that the index which is now in preparation will constitute the 18th or last volume of the work. The cause of delay in the publication of the 16th volume was the slow preparation of the German original, and the same cause is now operating in retarding the 17th volume, which, however, is expected to be ready this year. The completion of this great work will be hailed with satisfaction by every English and American chemist, and when the Index is ready to give a key to every portion of its immense collection of facts, its usefulness will be proportionately increased. The agent has in hand two sets of Gmelin's hand-book and several duplicate copies of the volumes from X. to XV. inclusive, which will be furnished at the Society's rates with the expenses of importation added. All who have failed to complete their sets of "Gmelin" would do well to attend to it early, as when the work is completed, this agency will probably be discontinued. The agent would also inform the scientific public that he has in store, on account of the Society, ten copies of Bischof's Chemical and Physical Geology complete, and several copies of Laurent's method, and the life of Dalton. It should be

distinctly understood that all payments on the Society's account and for duties, must be in gold, or its equivalent in currency.

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*Proceedings of the American Pharmaceutical Association at the Thirteenth Annual Meeting, held in Boston, Mass., September*, 1865; also, the Constitution and Roll of Members. Philad. 1866, 260 pp. octavo.

Before this number reaches our readers, those who are members of the Association will have received their copies of the "Proceedings" for 1865. After the delay of last year, it was generally anticipated that this volume would appear more promptly, but despite all the resolutions and precautions adopted by the Association, the Editor was not able to put the complete copy in the printer's hands until the 17th of January, although at that date much of it had been in type for months. A hurried glance over the book shows a full record of minutes, a meagre report on the progress of Pharmacy, but forty pages of answers to scientific queries, and thirty-six pages of volunteer papers; it is, in fact, the smallest volume since 1857. In looking for the cause of this deficiency of bulk, it will be found chiefly in the Report on the Progress of Pharmacy, which is less than 50 pages, against 123, 127, and 142 in the previous three years. The Chairman attributes it partially to causes over which he had no control, and largely to the inaccessibility of foreign journals, which delayed action upon them until too late to include much valuable information that might otherwise have been included from foreign sources. No one can fully appreciate the labor of preparing a report of this kind without they have undertaken it. Without a knowledge of the German and French languages, (or liberal aid from those who have it,) and a free access to the foreign pharmaceutical periodicals, it will be difficult, if not impossible, to prepare papers like those which for the previous three years have marked the Proceedings. The Report differs from most of its predecessors by a more detailed account of the papers to which it refers, which enables the reader to get a good idea of their contents.

Of the special reports and essays, we have published previously or in this number most of those which were read at the meeting, and some of the others we hope to print in future numbers. As a whole, the volume is very interesting and instructive; the paper on percolation alone is worth the cost of the volume, and the discussions appended to the minutes add very much to their interest and usefulness as a record of the proceedings.

A new feature of the volume is the Roll of Members, which is now classified in eight groups, consisting of honorary, active, and deceased members, and those whose names have been directed to be stricken from the rolls for neglect of payment of their contributions, because of resignation, or from not having signed the Constitution.

The paper, printing, and binding, are much as the previous year, and do not come up to some former volumes, when materials and workmanship were less costly than at present.

ACADEMY OF NATURAL SCIENCES.—An address, emanating from a large Committee of this Society, directed to all public spirited citizens who feel an interest in the promotion of science and the sustenance of this useful Institution and its valuable collection of natural objects, has been received. The object of the appeal is to raise by voluntary contributions the sum of $100,000, for the purchase of a lot of ground and the erection of a building to accommodate the collection now existing, with ample space for future additions. The present building is much too small to admit of the display of the specimens belonging to the Academy, which are suffering for want of the necessary accommodations. The address sets forth the reasons why this Institution should be liberally sustained; what it has done and is doing towards creating a taste for studies in Natural History, and by the semi-weekly gratuitous exhibition of its collection; the quiet and unseen influence which its exceedingly valuable scientific library of 30,000 volumes is affording to the scientifically inclined public, as any person introduced by a member may freely consult its pages. The following quotation from the address will explain:

"It is conjectured that not less than $100,000 will be required to accomplish the object in view. For this reason the payment of subscriptions is made contingent on the whole amount being subscribed within the present year. It is desirable, however, that a considerably larger sum should be at the service of the Institution, to secure sufficient income to pay skilled workmen to preserve the Museum, the contents of which are too valuable and too extensive to be confided to the voluntary labor and care of members. Even if the growth of the Academy is to be arrested now, as it will be if its appeal to the public shall fail, a considerable increase of revenue will be necessary to preserve it even in its present condition."

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THE VOLUME OF PROCEEDINGS OF THE AMERICAN PHARMACEUTICAL ASSOCIATION.—Attention is called to the following note from the Chairman of the Executive Committee:

"*Editor American Journal of Pharmacy,*—

"The Executive Committee respectfully ask you to call the attention of your readers to the Proceedings now issued, and especially to the fact that complete sets of the Proceedings can be supplied, for the first time. (For terms see Prefatory Note.) The amount of valuable information is so great that no pharmaceutical library can be deemed complete without them.

For the Committee,

*Feb.* 15, 1866. THOS. S. WIEGAND, *Chairman.*"

By reference to the Prefatory Note of the volume for 1865, just issued, we find that copies of the Proceedings of 1851 to 1856, inclusive, in pamphlet form, can be had for 25 cents each; that for 1857, bound, 70 cents; 1858, $1.50; 1859, $1.50; 1860, $1.00; 1862, $1.25; 1863, $1.25; 1864, $1.50; 1865, $1.50. The Committee say that the eight bound volumes and six pamphlets may be had for $11.00, a sum within the reach of all

who feel an interest in the Association, and that the entire set *unbound*, except for 1862, '63, and '64, may be had for $9.00.

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Obituary. Sir William Jackson Hooker.—This eminent Botanist and botanical writer died at Kew, so long the scene of his labors and usefulness, in the eighty first year of his age. He was born on the 6th of July, 1785, at Norwich, Eng. His father attained even greater age. He attended at the Norwich high school, and the accidental discovery of a rare moss gave the direction of his studies to botany. He made tours to the wilds of Scotland, the adjacent islands and to Iceland, in 1809, having became acquainted meanwhile with Sir Jos. Banks, Solander and other botanists. His success in the delineation of plants was quite remarkable, and was the cause of the illustrations of his numerous botanical works. Having been pecuniarily unfortunate, he obtained, through the influence of Sir Jos. Banks, the Regius Professorship of Botany in the University of Glasgow. "Here for twenty years, the most productive years of his life, he was not only the most active and conspicuous working botanist of his time and country, but one of the best and most zealous of teachers." His works are too many to even enumerate in this brief notice. When Kew Gardens were converted into a great national establishment by act of Parliament, Sir William J. Hooker was appointed to its direction, and during the remaining twenty-four years of his life he devoted his time and energy to the development and extension of this now extensive and wonderful collection of all that is interesting to the botanist. This hasty outline, gleaned from the excellent notice by Prof. Asa Gray, in Silliman's Journal, would be incomplete did we not allude to his single-minded and conscientious pursuit of science and his kindness and liberality to younger botanists. His son, Dr. Jos. Dalton Hooker, succeeds him as director of Kew.

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*Journal of Applied Chemistry*, devoted to Chemistry as applied to the Arts, Manufactures, Metallurgy and Agriculture. New York, January, 1866. Vol. I. No. 1, quarto, pp. 16. Dexter & Co., Publishers.

This new Monthly Journal, published under the editorial directions of Prof. H. Dussance, Chemist, is addressed to manufactures, chemists, druggists, agriculturist, and all who desire late information on technology and manufacturing chemistry. We find many points of interest in the number received, and observe quotations and lists of the New York, Boston, Philadelphia and Calcutta markets, which we presume are to be kept up monthly.

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*The United States Medical and Surgical Journal*, Dr. G. Shipman, Chicago, January, 1866, and *The New York Medical Journal*, Feb. 1866, have been received.

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The Annual Commencement of the Philadelphia College of Pharmacy will be held at the Musical Fund Hall, on the evening of Saturday the 17th of March, 1866, to which the friends of the College and the public are generally invited.